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MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### I. INTRODUCTION.

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By RICHARD P. STRONG.

*(From the Biological Laboratory, Bureau of Science, Manila, P. I.)*

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It has been the policy of the Biological Laboratory for several years past to send men to various provinces outside of Manila when opportunity presented itself, for the study of disease. During the present year, it was suggested by Doctor Garrison, United States Navy, medical zoölogist of the Laboratory, that a group of advanced students from the Philippine Medical School be selected and taken by him during their vacation of several months to some provincial town where a dispensary could be established and a study made of the diseases affecting the inhabitants. It was the intention not only to provide the students with practical training in medical zoölogical work, but at the same time to examine the inhabitants of the town, particularly with reference to the parasitic diseases with which they were affected. After consultation with the Director of the Bureau of Science and the Chief of the Biological Laboratory, it was decided to organize a more extensive expedition for the purpose of carrying on a complete medical survey of the inhabitants of such a town. A short time after this, the Director of Health requested assistance from the Biological Laboratory in carrying on a campaign in a provincial town for the purpose of examining and treating the natives for infection with intestinal worms, with the special purpose of determining the importance of hookworm infections in relation to the public health. As the extent and the nature of hookworm infections in the Islands was one of the questions which the expedition from the Bureau of Science had already planned to investigate, it was agreed that the Bureau of Health should join in the work of this survey.

The object of the expedition as finally planned was to make a complete study of a native town in the Philippine Islands under normal conditions. The investigations were performed by members of the staff of the Bureau of Science and of the Philippine Medical School, by three of the students of the school, and by Doctor Clements of the Bureau of



Health. The laboratory work extended over a period of three months, March, April and May of the present year.

The town of Taytay (Plate VIII, fig. 1, and Plate IX, fig. 2), which is situated on the eastern border of the Mariquina Valley, Province of Rizal, Luzon, was chosen because of its size (it has a population of about 6,000); and because in the past it has suffered severely from smallpox and from several epidemics of cholera, and has had a bad reputation from a sanitary standpoint. If a larger town had been chosen, it obviously would have been impracticable to have made as careful a study of the inhabitants as was planned.

It was the intention during the survey not only to observe how much sickness there was present and the nature of such sickness, but to examine into the character of the population, the conditions under which the people lived, the food which they ate, the water which they drank, and the diseases to which they were liable to be exposed. Following out this idea, a geological study has been made of the contour and formation of the country, the water supply has been examined and a chemical and bacteriological study performed of the well waters of the town used for drinking purposes; a botanical examination of the vegetable food stuffs and a general one of all material offered for sale in the markets have been carried out. The cost and quality of the food and the nutritive value of the diet of the people, from a physiological standpoint, have been studied. An entomological investigation of the mosquitoes and other insects of interest from a medical point of view has been accomplished. As regards the inhabitants, anthropometric measurements were performed, and in the case of those who visited the station, and particularly in those who were found at all sick or abnormal, a medical history was taken and a physical examination performed; the blood, fæces and sputum were examined microscopically, and, in many cases where the nature of the complaint warranted, serum reactions, differential blood counts, and examinations of the urine were made. The Bureau of Health in addition, through its representative, Doctor Clements, made a study of the general sanitary conditions under which the people lived, and a study of the vital statistics of the town. A dispensary was established at which all of the cases were treated and furnished with medicine free of charge. Various maps of the town were prepared and a census was taken.

*Laboratory investigations.*—The helminthological work and the general laboratory investigations of the expedition carried out at Taytay were placed under the direction of Doctor Garrison, and it is largely to his efforts and to those of Doctor Nichols of the United States Army and of Doctor Clements of the Bureau of Health, that the success of this portion of the work is due. A suitable nipa house near the center of the town was rented, and in this was established a station comprising the laboratory, a clinic and a dispensary. (See Plate VII.) An adjoining house

was rented also, in which the members comprising the expedition lived. The people throughout the town were invited to visit this station, first, as a place of curiosity for those who were well, where they could see laboratory apparatus, observe their own blood under the microscope, etc.; and second, as a place which offered to those who were sick an opportunity of being cured and of obtaining medicine free of charge. The plan of work at the clinic and laboratory was outlined as follows: To each individual who presented himself a ticket bearing his name was given; and a number, together with the name, sex, age, occupation and residence of the individual, was placed upon a clinical record card. A separate alphabetical index of names was kept in order to avoid error if a ticket were lost. Each person was then supplied with a test tube or bottle in which he was instructed to bring a specimen of his fæces on the following day. As many as could be examined were then passed to another room where they were subjected to a physical examination. A hæmoglobin estimate and an examination for malarial or other parasites was then made of the blood. The results of the examinations were then entered on the clinical card. In addition, separate records were kept of all laboratory examinations. If an individual proved of any particular interest from a medical standpoint, he was detained for further examination; otherwise he was discharged, or, if sick, was sent with his clinical card to the dispensary where his ailment was prescribed for and where he was given special instructions regarding treatment or regarding his return to the clinic and the bringing of specimens of fæces, sputum, or urine. In addition to the treatment of patients at this daily clinic, those who were unable to attend were visited in their homes, all the records of these cases being kept likewise. The time from 4 o'clock until dark was devoted usually by the members of the expedition to the mapping of the town and to making a census of the population. In the course of this work, the entire town was covered by a house-to-house inspection, the name, sex, and age of each inhabitant together with the surrounding conditions under which he lived, being entered upon a separate card for each house. The members of the expedition were able by means of this census to locate cases of serious or interesting diseases which otherwise might not have come to their attention. In some cases a person afflicted with a disease was able to direct the members of the expedition to other persons similarly afflicted, thus assisting in the discovery of all cases of disease in the town. This was particularly true in regard to goitre and yaws, diseases which the people could recognize easily.

The results of these investigations have all been collected and published together in the present number of the *JOURNAL*, with the exception of those carried on by Doctor Bean on racial anatomy at Taytay; these studies are not yet entirely completed and will appear later in Section A, General Science, Vol. IV, No. 5, of this *JOURNAL*, during the present year.

While the various divisions of the work were systematically distributed



among the members of the expedition, each giving his special attention to the work to which he was assigned, nevertheless considerable of the work was carried on by all the members of the expedition together; as, for example, the mapping of the town and the preparation of the census. Hence, while the individual reports have been written by those members of the expedition who performed the greatest relative amount of work upon the subject, nevertheless it should be understood that much of the work of the expedition was carried out by all of its resident members working together.

Special bacteriological examinations, such as of the waters of the town and of faeces for cholera vibrios, were performed at the Biological Laboratory in Manila where these specimens were sent daily by messenger.

In perusing the individual reports, it must be considered that in determining the incidence of certain diseases the members of the expedition relied solely upon the attendance of the individuals at the clinic; while in determining the incidence of the others, practically the entire population of the town was canvassed carefully. Therefore, the results obtained in relation to each disease must be carefully interpreted if they are to be used as an expression of the prevalence of such disease in the general population; obviously the same basis can not be used in computing the percentages for all diseases among the Filipino population throughout the Island of Luzon.

In the preparation of the reports upon the laboratory work performed at Taytay and the study of disease there, the subjects were considered and discussed jointly by Doctors Garrison, Nichols and Clements, and have been prepared for publication by these gentlemen, Doctor Teague and the writer.

This expedition is probably one of the most extensive of its kind that has ever been carried out and is certainly the most extensive medical survey that has ever been undertaken in the Philippine Islands. Its accomplishment was largely made possible through the efforts of Doctor Freer, Director of the Bureau, who, before his departure on his vacation early in April, did much to organize, arouse interest in and to stimulate the work of the expedition. The special reports of the members of the survey follow.

## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### II. GEOLOGY AND WATER SUPPLY.

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By GEORGE I. ADAMS.

*(From the Division of Mines, Bureau of Science, Manila, P. I.)*

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Taytay is situated on the eastern border of the broad Mariquina Valley, and at the western foot of the upland which extends from Antipolo into the Binangonan Peninsula. The church, which may be regarded as the nucleus of the settlement, stands on a low hill which is the western end of a peninsular area, intermediate in elevation between the valley and the hill country. (Plate VIII, fig. 1.) The town is nearly surrounded by lowlands devoted to the cultivation of rice. To the east of the town there are hills covered with cogon grass. Along the streams there is a growth of bamboo and in the valleys between the hills a variety of trees are found, which extend irregularly up the hill slopes. (Plate I.)

There are two streams which pass through Taytay. One comes from the north and has its course through the western part of the town. The other comes from the east and passes through the southern border. They join in the southwest part and the resulting stream continues to Bay Lake (Laguna de Bay). There is also a cut-off from the Cainta River which comes from the west but this is practically dammed now by the railroad grade. During the dry season the water of the streams stands in stagnant pools or entirely disappears, but in the wet season it has a considerable volume and affords communication to the lake by banca.

The main routes of travel from Taytay are westward to Cainta and across the Mariquina Valley towards Pasig and Manila and eastward to Antipolo. There is also a road southward to Angono and Binangonan, but it is little traveled. Banca traffic to the lake for fishing is important during the wet season. Taking these facts into consideration, it is easy to understand why the growth of the town in former times has been along the roads to the westward in the direction of the rice fields, and especially toward the juncture of the streams where fish are

brought to market. Lately, with the building of the railroad, the town has begun to grow near the station and it is probable that in a short time the towns of Taytay and Cainta, the latter but a short distance to the west, will form a continuous settlement. From a hygienic standpoint it would have been better if the inhabitants had built their homes on the hill land, but the advantages of a healthful location have been sacrificed for convenience in pursuing the agricultural and fishing industries.

*Geology.*—Besides the alluvium which forms the cultivated lands, the geologic formation at Taytay consists of a water-laid volcanic tuff, which in places contains conglomerate beds. Tuff outcrops conspicuously in the streets near the church and the municipal building, and along the road towards Antipolo. It forms the peninsula-shaped elevated area mentioned in describing the situation of the town. The bedding of the tuff is quite even in some places, but in others shows a thickening and thinning of the strata and some irregularities of deposition, especially in the conglomerate portions. Eastward of the town on the road to Antipolo, there are heavy beds of this formation which outcrop in a flat-topped hill, producing escarpments. (Plate VIII, fig. 2.) There is a slight dip of the beds to the westward, due in part to the inclination of the sea bottom on which they were deposited, but the amount of dip can not be determined accurately from the exposures.

The alluvium forms a veneer only a few feet thick over the tuff. A well at the cockpit between the municipal building and the railway station reaches the tuff at a depth of about 5 meters.

To the east of Taytay at the foot of the first range of hills, the formation comes in contact with igneous rocks. These geological relations are shown diagrammatically in the accompanying figure, No. 1.

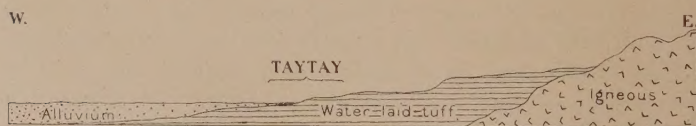


FIG. 1.—GENERAL GEOLOGIC RELATIONS AT TAYTAY.

*Water supply.*—Both the tuff formation and the alluvium are abundantly water bearing. To the east of the town there is a small spring which comes out of the tuff, but the place of issue is concealed by loose material. (Plate IX, fig. 1.) The water from this spring is usually made to run over a leaf from which it flows into a basin excavated in the tuff. During the dry season the stream of water is about the size of a lead pencil. This spring, although rather distant from the town, is largely used by the inhabitants who consider it the best water they can obtain, but it supplies a very inadequate amount.



The alluvium formation consists of a black soil which is cultivated for rice and is accordingly kept flooded with water during a large part of the year. The main streams at Taytay have low banks and during the flood season frequently overflow. Furthermore, there is a small branch from the rice lands which passes through the town when the fields are irrigated. Accordingly it will be understood readily that the alluvium formation is saturated thoroughly with water throughout most of the year.

The wells at Taytay fall into two classes—those which obtain water from the tuff formation and those which are dug into the alluvium. The deepest well in the tuff formation is situated in the *patio* of the convent which adjoins the church. It is not used by the public. The principal well of this class and the one most generally used by the town is situated in the street one block southwest of the municipal building. (Plate IX, Fig. 2.) It has a large cistern walled with blocks of tuff which are arched up to a rectangular opening, but the walls do not rise high enough above the ground to afford any protection from surface contamination. There are two smaller wells to the southeast near the border of the tuff area which obtain their water from this formation, and to the northeast of the town there are two shallow wells dug into the banks of the ravine and extending into the tuff. To the north of the town and beyond the limits of the map, there is a well excavated into the tuff which during the dry season contains only a little water. It is common for a man to climb down into this well and dip up the water, which is not present in sufficient amount to fill a bucket lowered from the surface.

The remaining wells of the town obtain water from the alluvium. Some of these are dug at a considerable distance from streams, others are on the banks of streams and some are in the stream channels, so that during the flood season they are overflowed. None of these wells have good curbs or walls to aid in the prevention of surface contamination. It is a usual thing for the people to take the water from the wells by means of buckets or oil cans lowered into the well on the end of a rope or pole, and in doing this they stand very near the opening of the well. Water accidentally spilled washes over the stones which wall the mouth of the well, and a part of it falls back into the well. Dirt which has been in contact with the natives' feet may fall into the well, or contamination may arise from dirt on their hands, which, upon drawing a second bucket of water, are more or less rubbed on the rope. The people of Taytay have the idea that wells near houses are apt to be dangerous sources of supply and so they generally prefer to bring water from the wells outside the town, especially during the dry season when the water has a lower level in the wells and becomes accordingly more turbid. The wells most frequented outside of the town are situated directly in the stream beds, and although the mouths of these wells are above the level of the water

in the streams or the drying mud, there is every reason to suppose that they receive filtrations from the stream channels which in places contain carabao wallows and stagnant water covered with green scum.

Enough has been said to show that there is need of deep tubular wells in order to insure a safe water supply for the town. Fortunately, the geologic structure is favorable to drilling and it is possible that in the southwest part of the town near the juncture of the streams, where the land is low, sufficient hydrostatic head might be encountered to produce an artesian flow. It is recommended that a deep well be drilled at this place with the hope of obtaining an artesian flow. In case an artesian well is not obtained the remaining wells which may be drilled in the town should be made only sufficiently deep to prevent surface filtration.

## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

### III. BACTERIOLOGICAL ANALYSES OF THE WATER SUPPLY.

By MOSES T. CLEGG.

(From the Biological Laboratory, Bureau of Science, Manila, P. I.)

The geologic conditions governing the water supply will be found in the article by Adams on page 211.

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| Well number 1, dug in alluvium, G and Fourth Streets. (Washing water.)<br>Number of bacteria per cubic centimeter, 5,000;<br>Bacillus coli communis;<br>Vibrios;<br>Amœbæ and flagellata.                    | Well number 6, issuing from tuff. (Spring drinking water.)<br>Number of bacteria per cubic centimeter, 500;<br>Flagellata. No amœbæ.  |
| Well number 2, dug in tuff, H and Third Streets. (Washing water.)<br>Number of bacteria per cubic centimeter, 8,000;<br>Bacillus coli communis;<br>Bacillus pyocyaneus;<br>Vibrios;<br>Amœbæ and flagellata. | Well number 7, dug in tuff. (Drinking water.)<br>Number of bacteria per cubic centimeter, 800;<br>Amœbæ and flagellata.   |
| Well number 3, dug in alluvium, M and Third Streets. (Washing water.)<br>Number of bacteria per cubic centimeter, 12,000;<br>Bacillus coli communis;<br>Vibrios;<br>Amœbæ and flagellata.                    | Well number 8, dug in a stream bed, "Pinagsalan." (Drinking water.)<br>Number of bacteria per cubic centimeter, 4,000;<br>Amœbæ and flagellata;<br>Vibrios.   |
| Well number 4, dug on the bank of a stream, H and Fifth Streets. (Washing water.)<br>Number of bacteria per cubic centimeter, 7,800;<br>Amœbæ and flagellata;<br>Vibrios.                                    | Well number 9, dug in a stream bed. (Drinking water.)<br>Number of bacteria per cubic centimeter, 3,800;<br>Bacillus coli communis;<br>Amœbæ and flagellata;<br>Vibrios.                                  |
| Well number 5, dug in alluvium, G, Fourth and Fifth Streets. (Washing water.)<br>Number of bacteria per cubic centimeter, 4,800;<br>Amœbæ and flagellata;<br>Vibrios.  | Well number 10, dug in tuff, "Capt. Luis." (Drinking water.)<br>Number of bacteria per cubic centimeter, 800;<br>Amœbæ and flagellata;<br>Vibrios.  |
|  | Well number 11, dug in the bed of a stream, "Manining." (Drinking water.)<br>Number of bacteria per cubic centimeter, 12,000;<br>Bacillus coli communis;<br>Bacillus pyocyaneus.<br>Amœbæ and flagellata. |



Well number 12, dug in the bed of a stream. (Drinking water.)	Well number 13, dug in the bed of a stream. (Drinking water.)
Number of bacteria per cubic centimeter, not determined;	Number of bacteria per cubic centimeter; 9,000;
<i>Bacillus coli communis</i> ;	<i>Amœbæ</i> and flagellata;
<i>Amœbæ</i> and flagellata;	<i>Bacillus coli communis</i> ;
<i>Bacillus pyocyaneus</i> .	<i>Bacillus pyocyaneus</i> ;
	<i>Vibrios</i> .

Well number 12 was examined particularly for the typhoid bacillus since cases of typhoid fever had occurred in the vicinity of it. A small, actively motile organism was isolated, which was pathogenic for small animals. It belonged to the colon group, but was not the typhoid bacillus.

None of the vibrios isolated from the above well waters were cholera spirilla and they were not agglutinated by anticholera sera. Some of them gave the cholera red reaction, others did not. Some were very toxic for guinea pigs.

In some of the houses in Taytay the drinking water is kept in earthen jars which stand side by side, the same utensils being used for removing water from both jars. Examination made of the drinking water of seven jars showed all infected with *amœbæ*.

# MEDICAL SURVEY OF THE TOWN OF TAYTAY.

## IV. CHEMICAL ANALYSES OF TAYTAY WATERS.

By GEORGE F. RICHMOND and V. Q. GANA.

(From the Chemical Laboratory, Bureau of Science.)

### Physical characters of Taytay waters.

Well No.	Color.	Odor.	Reaction to litmus.	Appearance on ignition.
1	Brownish	Earthy	Alkaline	Brown.
2	do	Fishy	Neutral	Do.
3	do	Earthy	Alkaline	Slight coloration.
4	do	do	do	Do.
5	do	Normal	do	Do.
6	Brown and turbid	do	Neutral	Blackening.
7	do	do	do	Do.
8	do	do	do	Brown coloration.
9	do	Like sewage.	do	Positive blackening.
10	do	Normal	do	Slight brown coloration.
11	Slightly brown and turbid	Earthy	Slightly alkaline	Do.
12	do	Normal	Neutral	Brown coloration.
13	Turbid	do	Alkaline	No coloration.

### Sanitary chemical examination, Taytay waters.

[In parts per million.]

Well No.	Total solids.	Mineral matter.	Organic matter.	Chlorine.	Oxygen consumed.	Nitrogen as—				Hardness.		
						Saline ammonia.	Albuminoid ammonia.	Nitrites.	Nitrates.	Temporary.	Permanent.	Total.
1	658.4	607.6	50.8	75.916	2.4	0.1153	0.1113	Nil.	1.5553	244.0	25.0	269.0
2	841.6	821.2	20.4	116.73	2.6	0.0447	0.1317	0.0202	23.035	162.0	100.0	262.0
3	1,489.6	1,415.2	74.4	367.34	2.2	0.0472	0.1417	0.0046	5.2982	430.0	250.0	680.0
4	2,295.2	2,126.4	168.8	438.77	3.4	0.1019	0.1789	Nil.	8.1511	364.0	630.0	994.0
5	1,359.2	1,256.0	103.2	263.26	2.3	0.0828	0.1094	0.0046	8.4746	334.0	340.0	674.0
6	268.4	258.0	10.4	6.122	7.5	0.1243	0.2312	Trace.	Trace.	66.7	Nil.	66.7
7	230.0	220.0	10.0	5.306	5.9	0.0621	0.1268	Trace.	Trace.	122.0	Nil.	122.0
8	255.6	242.0	13.6	5.306	0.6	0.0556	0.0278	0.0037	Trace.	115.0	Nil.	115.0
9	147.6	132.0	15.6	5.714	5.2	1.3623	0.2287	Nil.	Trace.	64.0	Nil.	64.0
10	230.2	218.4	11.8	10.204	1.2	0.0124	0.0447	Nil.	Trace.	96.0	Nil.	96.0
11	199.2	180.8	18.4	7.755	1.3	0.0149	0.0373	Trace.	Trace.	95.0	Nil.	95.0
12	199.2	176.0	23.2	4.898	0.95	0.0174	0.0770	Nil.	Trace.	88.0	Nil.	88.0
13	716.4	699.2	17.2	191.836	1.4	0.0323	0.0770	0.0128	2.2318	214.0	155.0	369.0

In interpreting the results of the chemical examination of these waters, the following conclusions would ordinarily be drawn: Waters from wells Nos. 1, 2, 3, 4, 5, 6, 7, and 9 would be considered entirely unsuited for drinking purposes in every respect on account of the high chlorine figures together with an excess of nitrogen in all of its forms. While the absence of chlorine is sufficient proof of the absence of sewage contamination, its presence does not necessarily indicate sewage contamination in countries adjacent to the sea. Therefore, not much importance should be placed upon high chlorine figures alone, but when they are accompanied by excessive amounts of nitrogen, particularly in the form of albuminoid ammonia and nitrites, the indication of pollution with sewage or drainage from refuse animal matter is almost conclusive.

Waters Nos. 8 and 13 would be considered of a doubtful character as the nitrogen as nitrites is above the allowable limits and the nitrogen in its other forms is too near the border line for safety.

Waters Nos. 10, 11 and 12 are well within the allowable limits of safety as regards the nitrogen in all its forms, the oxygen consuming power and chlorine content. In fact these waters from a chemical standpoint appear better in every respect than do many deep well waters which from the very nature of their source are free from surface pollution. When judged from the chemical findings alone, these three waters would be considered entirely safe for drinking purposes; hence too much reliance should not be placed on the sanitary chemical analysis of drinking waters alone. It is only when the source of the waters—i. e., location and kind of well—the physical characters and results of a biological examination of the water are known that the results of a sanitary chemical examination are of assistance in judging whether the water in question is potable.



## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### V. THE PRINCIPAL FOODS UTILIZED BY THE NATIVES.

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By E. D. MERRILL.

(From the Botanical Section of the Biological Laboratory, Bureau of Science,  
Manila, P. I.)

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Comparatively little has been written regarding the dietary of the natives of the Philippines, although it is a well-known fact that, in common with most oriental people, their staple foods are fish and rice. Among the poorer classes there is probably little variation from these primary articles of food, though their diet is modified by a number of food products of secondary importance. Taytay is a typical provincial town and its food supply seems to be almost entirely local, although it is within a short distance from Manila; hence the town in this respect is characteristic of most medium-sized and small settlements in the Philippines.

Here, as in nearly all other parts of the Archipelago, rice is the basis of the meal, and fish, both fresh and dried, apparently ranks as the second most commonly utilized food. The town is situated in the midst of a large rice-growing region, and the supply of this staple is practically all local, although in times of scarcity foreign rice is brought from Manila. Comparatively few varieties of rice seem to be cultivated locally, at least in any great quantity.

Most of the fresh fish found in the local markets, and apparently most of the dried fish, are fresh-water varieties secured in Lake Bay, although some dried fish originating in salt water is brought from Manila. The variety found locally is very limited, the only kinds noticed by me in any quantity being the species known as *dalag* and *candoli*, both fresh-water fish brought from Lake Bay, and these were found fresh (alive) and salted. Other varieties said to be brought into the market at various times are *kitang*, *buan-buan*, *tabilong*, *talakaitok*, *palos*, *tegiti*, *hito*, *bia*, *ayunġin*, *tuyo* and *matinik*. Dried fish, imported from Manila, and apparently always to be found in the market or in the tiendas in greater or less abundance, are *halobabai*, *sapsap* and *dilis*. *Hipon*, a small fresh-water shrimp, is usually abundant in the market. No other shellfish were observed.

Meats play a very secondary part in the local dietary as in other parts of the Philippines. Apparently the only local supply that is at all constant is of fresh pork; pigs, both large and small, being abundant in the town and always offered for sale on market days. Goats are utilized for food to a limited extent. Beef is apparently never, or at least very rarely, offered for sale in the local market; a meat closely resembling it—that is, the meat of the water buffalo or carabao—is probably sold at times here as in other Philippine towns, but the supply must be very limited and inconstant as these animals are far too valuable for other purposes to be used for food under ordinary conditions, so they are probably rarely slaughtered for food except when incapacitated for further work. Here, as elsewhere in the Archipelago, animals such as horses and carabaos that have died a natural death from any cause are doubtless utilized as food, although no direct evidence is at hand bearing on the local case.

Fowls, especially chickens and ducks, are found abundantly locally and are considerably utilized for food, especially among the natives of the well-to-do classes, while eggs, both fresh and “balut” (incubated) are somewhat used. The comparatively high price of all meats, poultry and eggs, place these products beyond the means of the average native of the laboring class for regular articles of diet.

Various prepared foods are sold in the market and in the tiendas, such as *suman*, made of tapioca, rice and sugar, wrapped in banana leaves and boiled; *poto*, made of boiled rice flour and sugar; *poto seco*, the same thing, but dried after cooking; *bibinka ñg malagkit*, prepared from a glutinous variety of rice with grated coconut meat and sugar, and doubtless some other similar forms of food. Various prepared foods of Chinese origin are also sold, such as *gulaman*, made from a seaweed; *bihon*, made of rice flour, corresponding roughly to our spaghetti; and *miki* somewhat similar but made of rice flour and mongo beans (*Phaseolus mungo*). Cakes made from wheat flour, either baked locally or imported from Pasig or Manila, are sold in small quantities. Wheat bread is used scarcely at all, so that wheat can not be considered to have any place in the dietary of the average native.

Dairy products such as milk, butter and cheese have no place in the dietary of the natives, except the former, which is obtained from the water buffalo and is used to a limited extent.

In spite of the proximity of Taytay to Manila with its relatively very rich markets, its food supply seems to be almost entirely local as noted above. Imported preserved meats, fish, fruits, vegetables, milk, butter, cheese, etc., are not to be found in the local markets or tiendas, and are probably not at all utilized by the inhabitants of the town or else to a very limited extent and among a very limited class of inhabitants. Fresh potatoes, onions, etc., although always to be found in the Manila market, are rarely obtainable locally, and then only in very limited quantities.

Below is given a list of the different fruits, vegetables, pot herbs, and condiments found in the markets of Taytay, giving so far as possible their native, English and scientific names, their origin, whether grown locally or imported, and their uses. The list of fruits especially is a comparatively long one, but for many of them the season is comparatively limited, and with the exception of bananas and coconuts, none of them are to be found in the market throughout the year; doubtless a few additions could be made to the list by examining the products sold in the local markets at other seasons. It should be remembered also that a high percentage of the fruits utilized by the natives and many of the vegetables, judged from the European or American standpoint, are decidedly inferior and are scarcely ever or not at all utilized by others than the natives; while many of them are to be found in only very limited quantities so that the list of available foods is really smaller than one would be led to expect from mere examination of the appended list. Of the entire list of fruits given below, bananas, mangoes and pineapples are the only ones that can be ranked as first-class fruits from an edible standpoint.

## FRESH FRUITS.

- Bananas (including both the common banana and the plantain; *Musa sapientum* L., and *M. paradisiaca* L.). Three varieties are found in abundance, all grown locally—*gloria* and *latandal*, edible bananas, and *saba*, a plantain used for food only when cooked.
- Anonas (custard-apple or bullock's heart, *Anona reticulata* L.). A fruit of American origin, grown locally and in small quantities.
- Ates (sweet-sop, *Anona squamosa* L.). Like the preceding, a fruit of American origin, somewhat more abundant than the custard-apple.
- Bayabas (guava, *Psidium guajava* L.). A fruit of American origin, very abundant and grown locally without cultivation; the fruits are inferior.
- Bilimbi (*Averrhoa carambola* L.). A very acid fruit of American origin, usually eaten with fish or with other foods when something sour is desired; common but in limited quantities.
- Calamansi (lime, *Citrus medica* Linn., var.). A small very acid lime, found in limited quantities, utilized like the preceding.
- Camates (tomato, *Lycopersicum esculentum* Mill.). Of American origin, found in the markets in abundance, but inferior in size and flavor.
- Camias (*Averrhoa bilimbi* L., and *Cicca disticha* L.). Found in limited quantities, similar in flavor and uses to Bilimbi.
- Cahel (sour orange, *Citrus aurantium* L., var.). A very sour, tight-skinned, light-yellow orange, grown locally; found in small quantities.
- Casoy (cashew, *Anacardium occidentale* L.). A fruit of American origin, eaten fresh; the seeds are roasted and eaten. Common.
- Dayap (lime, *Citrus medica* L., var.). Abundant in season.
- Granates (pomegranate, *Punica granatum* L.). Very rare, apparently used mostly for medicinal purposes.
- Guanabano (sour-sop, *Anona muricata* L.). A fruit of American origin, grown locally; not abundant.
- Lansones (*Lansium domesticum* Jack). In season; imported from the lake region.
- Lucban (pomelo, *Citrus decumana* L.). Grown locally, rather common.



- Manga (mango, *Mangifera indica* L.). Very abundant in season.
- Melon (muskmelon, *Cucumis melo* L.). Occasional, inferior in flavor.
- Naranjitas (orange, *Citrus aurantium* L., var.). The common looseskinned, sweet orange of the Philippines.
- Niog (coconut, *Cocos nucifera* L.). Common in the market, imported from the lake region.
- Papaya (papaw, *Carica papaya* L.). A fruit of American origin, very common.
- Piña (pineapple, *Ananassa sativa* Lindl.). Abundant in season, of American origin.
- Sampalok (tamarind, *Tamarindus indicus* L.). Abundant; in addition to the use of the fruit, the flowers and young leaves are cooked with fish.
- Sandias (watermelon, *Citrullus vulgaris* Schrad.). Rather common, but inferior in texture and flavor.
- Santol (*Sandoricum indicum* Cav.). A native fruit, inferior.

## VEGETABLES.

- Ampalaya (*Momordica charantia* L.). It is cooked with fish and used in stews; common.
- Batao (*Dolichos lablab* L.). A common bean.
- Bawang (garlic, *Allium sativum* L.). Found in all small stores and common in the market.
- Calabaza (squash, *Cucurbita maxima* Duch.). Rather abundant but in limited quantities; the young shoots and flowers are also cooked as a pot herb.
- Camote (sweet potato, *Ipomoea batatas* L.). Abundant.
- Camoting cahoy (cassava, tapioca, *Manihot utilisima* Pohl). Common in cultivation, but not utilized extensively.
- Cebollas (onions, *Allium cepa* L.). These are imported from Manila, in very small quantities; young onions grown locally and eaten raw as a relish are found in the market and are known as *cebollas na mura*.
- Gabi (taro, *Colocasia antiquorum* Schott). The fleshy corms are common in the market. In many parts of the Philippines the leaves and petioles are cooked as a pot herb, but I am informed that they are not so used here.
- Labong ñig cauayan (bamboo shoots, *Bambusa* sp.). Rather common, in season.
- Maiz (Indian corn or maize, *Zea mays* L.). Of American origin; very commonly cultivated and found in abundance.
- Mongos (green gram, *Phaseolus mungo* L.). A very small bean, found in abundance.
- Opo (bottle gourd, *Lagenaria vulgaris* Seringe). Rather common.
- Patatas (potato, *Solanum tuberosum* L.). Imported in small quantities from Manila.
- Patola (*Luffa cylindrica* Roem. and *L. acutangula* Roxb.). Rather common.
- Poso (banana flowers, *Musa paradisiaca* and *M. sapientum*). Common.
- Rabanos (radishes, *Raphanus sativus* L.). The radish is found in abundance in season, and is eaten both raw and cooked.
- Sincamas (turnip-bean, *Pachyrhizus bulbosus* Kurz). Very abundant in season, eaten raw.
- Sitao (Chinese bean, *Vigna sinensis* Endl.). Abundant.
- Talong (egg plant, *Solanum melongena* L.). Abundant.
- Tsitsao (green peas, *Pisum sativum* L.). Rather abundant in season.
- Tubo (sugar cane, *Saccharum officinarum* L.). Abundant.
- Ubi (yam, *Dioscorea daemona* Roxb.). Found in small quantities; probably other varieties of yams are more or less utilized.

## POT HERBS.

- Calabaza (squash, *Cucurbita maxima* Duch.). The young shoots and flowers are commonly used for greens.
- Camote (sweet potato, *Ipomoea batatas* L.). The young shoots and leaves are commonly used.
- Caturay (*Sesbania grandiflora* Poir.). The large white flowers of this tree are cooked as greens.
- Cancong (*Ipomoea reptans* Poir.). Much like sweet-potato leaves and shoots, and similarly used.
- Mostaza (mustard, *Brassica juncea* Coss.). Cultivated, the stems and leaves utilized.

## CONDIMENTS.

- Achuete (amatto, *Rixa orellana* L.). The seeds are used to give a reddish color to cooked rice, and to various dishes in which rice is the chief ingredient.
- Alibangbang (*Bauhinia malabarica* L.). The leaves and young shoots of this tree have a pleasant acid taste and are cooked with rice.
- Luya (ginger, *Zingiber officinale* Rosc.). Commonly found in the market.
- Sanki (star anise, *Illicium verum* Hook.). The dried fruits are found in the tiendas; imported from China.
- Sibug (*Acacia pennata* Willd.). The pods are used to flavor fish.
- Sili (Chile pepper, *Capsicum frutescens* L.). Abundant, and much used.
- Sampalok (tamarind, *Tamarindus indica* L.). The flowers and young shoots are cooked with fish, etc.





## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### VI. THE FOOD OF THE PEOPLE OF TAYTAY FROM A PHYSIOLOGICAL STANDPOINT.

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The importance of the quality and composition of the food of a population from the standpoint of health suggested that a study of this question with regard to the people of Taytay was necessary to complete the investigations being carried on concerning them. This material seemed also to offer a welcome supplement to my first investigations on the nutrition of the Filipino people,<sup>1</sup> since I hoped to get from it an idea of the nourishment of a tropical people living according to their usual custom in a provincial town free from white men. In my first paper I mentioned the difficulties which attend the study of such questions in such a country; however, the relative simplicity of the food of these people of Taytay makes it possible to collect the more important data with sufficient accuracy. The following plan was adopted in order to obtain the information desired.

A number of houses in every district of the town were visited and the head of the family questioned in such a manner as to obtain all data of interest for the subject under consideration. These inquiries were made as far as possible by the writer in Spanish, or, with the help of a student assistant of the Philippine Medical School as interpreter, in Tagalog.

The food of the Taytay population consists for the most part of rice, and fish is next in importance as an article of food. Vegetables and fresh fruits which vary with the season of the year are eaten also, but in relatively small quantities. Cane sugar and sweets made of sugar and rice flower, and other preparations rich in carbohydrates, such as agar-agar and tapioca, are eaten between meals. Beef and milk and

<sup>1</sup> *This Journal, Sec. B* (1909), 4, No. 3, 195.

its products have, under the present agricultural conditions, no significance as food products. Occasionally a carabao may be killed and its meat eaten during a *fiesta*, but this occurs only very rarely. Chickens and eggs are as a rule too expensive for the poorer and middle classes.

The above facts show that in making a study of the food and its nutritive value for these people, one has to consider principally the quantity of *rice* and *fish* eaten daily. The protein material found in the vegetables and fruits can be neglected and the protein in the few eggs occasionally eaten is too small in amount to be of any importance. However, the caloric value of the sugar and the sugar preparations and of the carbohydrates found in vegetables and fruits can not be disregarded altogether. This general discussion indicates sufficiently clearly the character of the inquiries which were made in pursuing this subject.

Rice is kept on hand in most of the houses and the people are able to state fairly accurately how much is used daily and also how many days a given amount will last. In measuring the quantity used, the old Spanish terms *gantas* (3 liters) and *chupas* (0.375 liter) are used. In a few instances only the amount of palay bought at certain intervals in the past is stated. In these cases 2 chupas of palay have been considered equal to 1 chupa of rice. One chupa of rice costs 3 centavos and 1 chupa of palay 1.5 centavos. It was more difficult to obtain similar data regarding the fresh food products which were purchased daily in the markets, because they were not sold in weighed amounts.

In every household we were able to obtain a fairly accurate idea of the average total amount of money (*gastos*) spent daily in the market in the purchase of fish, vegetables, sugar and cigarettes. It was found necessary to make separate inquiries as to the amount of money spent for fish alone, owing to the important place which this product occupies in the daily diet. Furthermore, the number of persons has been ascertained who take their meals regularly in the household; these are divided into four groups; adult males, adult females, children (under 10 years) and babies (under 10 months). Finally, an attempt was made to gather, by means of tactful inquiries and a careful observation of the general aspect of the house and its surroundings, some idea as to the class of society to which the inmates belonged, their occupation, the extent of their possessions and also the number of domestic animals on the place. Inquiries in twenty-five different families of all classes of the population of Taytay gave the following result:

TABLE I.

No.	Males.	Females.	Children.	Babies.	Chupas of rice per day.	Daily amount spent for all food stuffs except rice.	Daily amount spent for fish only.	Remarks.
1		4	3		11	₱0.50		
2	4			1	8	.35		4 hens are fed what remains.
3	2	3	2		11	.30		
4	5	3			21	.50		1 hen is fed what remains; very hard-working man.
5	4	1	1	1	16	.60		7 hens are fed what remains.
6	1	1	2		8	.20	₱0.10	
7	1	1	a1	b1	6	.10	.08	1 pig costs extra 10 centavos daily.
8	1	1	c1		6	.10	.08	2 hens are fed what remains.
9	1	1	d2		6	.15	.08	4 hens.
10	1	1			6	.50	.40	Very wealthy; 15 hens; for these 2 chupas of palay are bought daily.
11	1	1	2		6	.40	.30	10 hens; for these 2 chupas of palay are bought daily.
12	1	3	e1		6	.40	.27	
13	4	2	2	f1	12	.50	.40	1 pig is fed the remainder.
14	1	2	2		7½	.30	.20	
15	1	1	1		6	.60	.48	Wealthy people; 6 hens are fed.
16	1	1	2	1	5	.25	.20	
17	1	1	2	g1	6	.25	.20	1 pig is fed the remainder.
18	3	2			14	.80	.50	3 men working, have "tienda" in market.
19	2	2	h1	i1	10	.20	.20	No expenses for vegetables, etc.
20	2	1	j2		9	.40	.35	Chinelleria, middle class.
21	2	2	k1		9	.20	.10	Fisherman.
22	1	2	1		6	.20	.10	2 pigs are fed extra food.
23	2	1	1		6	.25	.20	2 hens are fed what remains.
24	1	2	l1		6	.20	.15	1 pig is fed extra food.
25	2	1		m1	6	.25	.15	

\* 4 years.

b 11 months.

c 8 years.

d One 1 year and one 2 years.

e 6 years.

f 12 months.

g 2 months.

h 12 years.

i 14 months.

j One 9 years and one 6 years.

k 2 years.

l 3 years.

m 2 months.

For a clear understanding of this table, the data obtained must be reduced to a comparative basis; that is, the amount per person. This has been done by counting children above 10 years as adults, children from about 5 to 10 years as two-thirds of a person, from about 2 to 5 years as one-half a person, and children from about 1 to 2 years as one-third of a person. Babies under 10 months have been omitted altogether in Table II. At the same time the chupas of rice in this table have been changed into grams, taking 1 chupa of rice as 370 grams. In this way Table II has been obtained, which presents the data of Table I in a more readily comprehensible manner.



TABLE II.

No.	Males.	Females.	Children.	Babies.	Estimated number of members.	Amount of rice required in grams.	Daily amount spent for fish.	Rice per person in grams.	Fish per person.	
10	1	1	0	0	2	2,220	₹0.40	1,110	₹0.20	Very rich people.
8	1	1	*1	0	2½	2,220	.08	880	.03½	Wealthy people.
15	1	1	1	0	2½	2,220	.48	840	.18	
7	1	1	1	*1	3	2,220	.08	740	.03	
9	1	1	*2	0	3	2,220	.08	740	.03	
11	1	1	2	0	3	2,220	.30	740	.10	
25	2	1	0	*1	3	2,220	.15	740	.05	
24	1	2	1	0	3½	2,220	.15	670	.04	
6	1	1	2	0	3½	2,960	.10	850	.03	
16	1	1	2	1	3½	1,850	.20	560	.06	
22	1	2	1	0	3½	2,220	.10	630	.03	
23	2	1	1	0	3½	2,220	.20	630	.06	3 females. Fisherman. 3 men working. 4 females. 4 males. Unreliable.
17	1	1	2	*1	3½	2,220	.20	630	.06	
20	2	1	*2	0	4½	3,330	.35	740	.08	
14	1	2	2	0	4½	2,775	.20	620	.04½	
12	1	3	1	0	4½	2,220	.27	500	.06	
21	2	2	1	0	4½	3,330	.10	740	.02	
19	2	2	*2	0	5	3,700	.20	740	.04	
18	3	2	0	0	5	5,180	.50	1,030	.10	
1	-----	4	3	0	6	4,070	(1)	660	-----	
5	4	1	1	1	6	5,920	(1)	980	-----	
2	4	2	0	1	6	2,960?	(1)	490?	-----	
3	2	3	2	0	6½	4,070	(1)	625	-----	
13	4	2	2	1	7½	4,440	.40	590	.05	
4	5	3	-----	-----	8	7,770	(1)	960	-----	

\* 3 years.

\* 4 years.

\* 11 months.

\* One 1 year and one 2 years.

\* 2 months.

† 3 years.

‡ 2 months.

§ One 6 years and one 9 years.

|| 6 years.

|| 2 years.

\* One 1 year and one 12 years.

† Data not obtained.

‡ Price below average (fisherman).

In only a few instances does the amount of rice taken daily by one person differ markedly from the main average. It is easy to understand that the rich family, No. 10, consisting of only two persons, does not live as economically as the others. Families No. 2 and No. 12 give a very low average, and family No. 18 a very high average. It is well to eliminate these four families in determining the average food consumption of the people. If we now examine the remainder of the families, it is found that the amount of rice per person is higher if the members of the family are almost all males, while it is lower if the members are females. A comparison of families Nos. 1 and 5, for example, illustrates the physiological fact that the hard working man needs a larger amount of

carbohydrates than the less active individual and therefore takes more rice. The average amount of rice per person is about 700 grams, but for a hard-working man it is somewhat higher, from 850 to 900 grams.

The fish eaten by the people of Taytay deserves our attention especially as a source of protein, the content of fat in the Philippine fishes being very low, at the most only 1 to 2 per cent; this means that the fish contains only one-tenth as much fat as protein. As already mentioned, the amount of fish eaten per person can not be determined with the same accuracy as the amount of rice. The differences between the poorer classes and the richer are here more pronounced, but the possibility must be borne in mind that the richer man spends more money for this food-stuff not because he buys more fish but because he selects a better quality. If we omit the exceedingly high values of both the families marked as wealthy in Table I, we see that from 3 to 10 centavos daily are spent for fish and that a great number of the people, 5 out of 18 (28 per cent), live on 3 centavos worth of fish daily. From our standpoint it seems important to find out what quantity of nutritive food stuffs, especially protein, can be purchased daily in the markets of Taytay for this amount of money.

With this in view, I sent a reliable native boy of Taytay (and not a Filipino student, since the latter might be looked upon as a foreigner and hence get less for his money than a native of the village) to buy 10 or 20 centavos worth each of the different kinds of fish in the market. I then took the weight of each sample and determined the edible part and its percentage of nitrogen (Kjeldahl) as a measure of the protein content. Five kinds of fish were selected—*tiguiti*, as an example of a very cheap fish; *dalag*, as an example of an expensive fish; *tuyo*, a half-dried sardine; *dilis*, a small dried fish; and *hipon*, a dried shellfish.

The following table gives the results of the investigation:

TABLE III.

Name and kind of fish.	Cost in centavos of 100 grams edible material.	Amount nitrogen in 100 grams edible material.	Amount protein in 100 grams edible material.
<i>Tiguiti</i> , fresh fish, very cheap; only eaten by the poorer classes	1.1	2.52	15.75
<i>Dalag</i> , larger fish regarded as good	3.6	3.02	18.88
<i>Tuyo</i> , a fish resembling a small sardine not so highly esteemed	5.0	4.62	29.00
<i>Dilis</i> , very small dried fish imported from Manila	7.0	10.10	63.13
<i>Hipon</i> , small shellfish, partially dried	7.2	10.68	66.55

TABLE IV.

For 3 centavos the following amounts can be purchased:

Fish.	Grams protein.
<i>Tiguili</i> .....	43
<i>Hiyon</i> .....	28
<i>Dilis</i> .....	27
<i>Tuyo</i> .....	18
<i>Dalag</i> .....	16

For 3 centavos 40 grams protein are available in a cheap kind of fish, but one may spend twice and three times as much to get the same amount of protein in one of the more expensive kinds of fish. In view of the amount of money found to be expended per person in fish, we are justified therefore in assuming that about 40 grams of protein are consumed in this way.

Finally, only a rough estimate can be made of the amount of money expended for fruits, vegetables, etc. For 2 centavos one could obtain in the Taytay market or "tiendas" about 100 grams of candy such as "caramelo," which would have a caloric value of less than 400. Fruits and vegetables purchased for the same money have a still lower caloric value. For example, for 2 centavos one can buy about from 200 to 300 grams of the edible portion of bananas; that means about 4 grams of protein and from 45 to 60 grams of carbohydrates with a caloric value of from 200 to 250. In the tropics where the bananas grow wild, one can usually obtain them daily without cost. Probably about 500 calories daily should be added for vegetables, fruits, etc.

In conclusion, the following table indicates the result of the attempt to find out the composition and caloric value of the food of the people of Taytay:

TABLE V.

Daily.						
For the average person.			For the hard-working man.			
Quantity in grams.	Protein in grams.	Calories.	Quantity in grams.	Protein in grams.	Calories.	
Rice.....	700	50	2,000	850-900	60	2,400
Fish.....		40	200		40	200
Vegetables.....		500				500
Total.....		90	2,700		100	3,100

The diet represents therefore 90 grams protein and 2,700 calories for the average person and for a hard-working man 100 grams protein and 3,100 calories. These amounts correspond very well with the data I

collected in my first paper <sup>2</sup> concerning the food given to the prisoners in Bilibid Prison and also agrees with the result of inquiries made at that time in the city of Manila. I have considered also the rations of the native troops, known as Philippine Scouts, and have found the daily food per person represents about 3,000 calories.

Since the latest researches indicate a causal connection between certain kinds of rice and beriberi, and since rice is the most prominent constituent of the food of these people, it is interesting to note that not a single case of beriberi was found in Taytay. Practically all the rice used in this town belongs to the class of "cured" rice, which according to some observers never causes beriberi even when it forms the greater portion of the nutriment over a long period of time. The rice is prepared at home and is unpolished; polished or "uncured" rice is found only very rarely.

Finally I have calculated the cost of the daily food of a man living in the usual manner in the town of Taytay. This is shown in the following table:

TABLE VI.

Fam- ily No.	Average cost of the food of one person.	Fam- ily No.	Average cost of the food of one person.
1	₱0.14	14	₱0.12
2	.10	15	.27
3	.10	16	.12
4	.13	17	.14
5	.16	18	.24
6	.13	19	.10
7	.09	20	.15
8	.12	21	.11
9	.11	22	.12
10	.34	23	.14
11	.16	24	.12
12	.13	25	.15
13	.12		

If we omit the rich families No. 5, No. 10 and No. 18 which expended an excessively high amount for food, we see that the cost of the food for one person ranges between 9 and 16 centavos daily, with an average of  $12\frac{1}{2}$  centavos per person. It may not be without interest as having a bearing on many sociologic and economic questions in these Islands to state that in a provincial town a Filipino can live very comfortably on about 12 centavos a day.

<sup>2</sup> *Loc. cit.*





## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### VII. MOSQUITOES AND OTHER INSECTS.

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In connection with the medical and sanitary investigations of the town of Taytay, it was thought desirable to give some attention to the mosquitoes and other insects found there with a view of establishing, if possible, the rôle that these pests now play in the transmission of disease, the likelihood of their becoming important in the future and the methods of dealing with them in this community or under similar conditions in other communities.

Taytay is situated in a fairly level plain, and hence there is almost no possibility for the establishment of such a system of drainage as would make it perfectly free from stagnant or semistagnant water; and even were the possibility of the installation of a drainage system to be considered, we would still be confronted with the fact that the town is in the center of a rice-growing district and the people depend largely upon rice raising for their livelihood and food. Therefore Taytay must always, during the rainy season, be surrounded by paddy fields which offer the best possible breeding places for mosquitoes and flies.

The streams, which practically surround the town, are never wholly dry at any season of the year and even at the height of the dry season they are semistagnant and offer excellent breeding places for mosquitoes. The wells, of which there are some 14 or more in or near the town, furnish still another breeding ground which, while not as productive as those bodies of water that are nearer the surface, nevertheless add their quota to the mosquito total of the town.

It will be seen by reference to the map (Plate II) that a good sized stream flows west of the town while another flows parallel with it through the western edge of the town for its whole length, the two streams finally join at the southern border. Before they join three other streams flow into the eastern one of these two, one from the east along the northern

border of the town, one from the northeast through the middle of the town, and one from the east through the southern portion. The main stream comes from north of Taytay; the others are simply outlets to the basin east of the town. These streams cease to flow during the dry season, and as the water evaporates more and more there forms in their basins a series of small ponds or puddles in which green algæ grow and which serve as ideal breeding places for *Myzomyia rossii* Giles, *Culex amnuli-ferus* Ludl., *Culex argentinotus* Banks n. sp., and *Culex taytayensis* Banks n. sp. The paddy fields, while always serving during the rainy season as breeding places for *Myzomyia*, become such in the dry season only if sufficient rain falls to cause puddles of a week's or ten days' duration.

In view of the fact that *M. rossii* will breed wherever green algæ are present in bodies of stagnant water, even if no water occurred in the rice paddies during the dry season, there would always be sufficient water in the streams and shallow water around the wells to furnish an abundance of mosquitoes in the town. Such was the condition which I found at Taytay in the early part of May, that is to say, I discovered either adults, pupæ or larvæ of *M. rossii* in all the streams surrounding the town as shown by the accompanying map. (Plate II.)

Another excellent breeding place for mosquitoes, especially *Culex fatigans* Wied., and *C. concolor* Desv., is to be found in the sanitary midden pit adopted quite generally in Taytay since the last outbreak of cholera. It consists of a hole from 50 centimeters to 1.5 meters square and of the same relative depth, the sides sloping inward and the rim being reinforced with halves of bamboo trunks pressed into the soil around the hole. In addition, strips of bamboo are placed across those pits over which an outhouse is not built, a space being left in the center through which the feces may fall. Those pits which lie in low land have from 20 to 40 centimeters of water in them constantly, and serve as admirable breeding places for the species of *Culex* above mentioned; the pits that are on higher ground may contain water after a heavy rain and thus serve the same purpose.

The level of the water in the wells seldom falls below 2 meters from the ground surface so that mosquitoes may breed there also. However, as only a few specimens were met with during the investigation I think these wells may be regarded as a rather negligible quantity in the way of breeding places.

Every house in the town of Taytay has one or more *galongs* or *bangas*, (earthen water jars.) The water is used for drinking and general purposes and these jars, though frequently covered with a board or other cover, may be found invariably to contain quantities of larvæ of the mosquito practically always present in the Philippines in the day-time, viz, *Stegomyia persistans* Banks. I found specimens of *S. samarensis* Ludl. occasionally in these jars, but only in very small numbers.

Another source of mosquitoes is to be found in the puddles which collect around the wells, especially around those wells which supply water for laundry purposes. As there are some 14 or more of these distributed through the town it will be seen that they are worthy of consideration. *Culex fatigans* was found breeding in several of these puddles, while in two cases *C. taytayensis* was found.

According to Doctor Nichols and Doctors Guerrero and Sevilla, who studied the distribution of malaria in Taytay, the majority of the cases of this disease were grouped along the large stream running north and south through the western edge of the town, and truly enough it was along this piece of water where the greatest numbers of *M. rossii* were taken. They occurred at points more remote from the center of the town, as at the well called "Pinagsalaan" and the large well southwest of the town; but, naturally, those mosquitoes found breeding within the limits of the town would be the most dangerous.

The very large majority of the people of Taytay use no mosquito nets; in fact, it is probable that not more than a half dozen families have these very necessary articles. It will thus readily be seen that the prevalence of malaria, either latent or sporadically active, would be largely a question of the abundance of malaria-carrying mosquitoes and the presence of individuals with the malarial parasite in the blood; in other words, the town of Taytay represents a locality in which no prophylactic measures against malaria are in operation.

The malarial parasite was found by Doctor Nichols in 3 per cent of those examined; 5 per cent of those persons who harbored malarial parasites showed no clinical symptoms of malaria. Enlargement of the spleen was encountered in 2.1 per cent of the children examined and in 1.4 per cent of the adults. These facts indicate a rather low degree of infection and are borne out by the rather noteworthy fact that while *Myzomyia rossii* was found in all the streams surrounding the town, the total number of this species was small in proportion to the area surveyed. This degree of prevalence of the mosquitoes is strikingly less than that found at Olongapo<sup>1</sup> and at Cervantes,<sup>2</sup> but it must of course be understood that the topography of both these places is entirely different from that of Taytay, a much larger area being covered with water in both Olongapo and Cervantes.

As far as the danger from malaria and the conditions of its propagation are concerned, Taytay is probably as favorably situated as any town which I have seen in the Philippines. Of course the ideal situation for a town would be one on very high ground away from streams or from the region of an open expanse of water, but towns of such character are few in these Islands.

<sup>1</sup> *This Journal*, Sec. B (1907), 2, 513.

<sup>2</sup> *Ibid.* (1908), 3, 335.



## FLIES.

*Musca domestica* L., (The typhoid fly) breeds almost exclusively in horse manure, though in the absence of this it will utilize cow or carabao droppings. Other species of *Musca* breed more indiscriminately and many other of the Muscidae taken in Taytay were found in decaying vegetable and animal matter.

In all, some 18 species of flies including 2 species of Tabanidae (horse-flies) were collected in the town. Individuals of many species of flies were secured from the leaves of banana plants growing under trees infected with Coccidæ. The honey dew voided upon the banana leaves by the scale insects furnished an attractive food for the flies and I was thus enabled to collect a considerable number. With the exception of *Musca domestica* L., and *Stomoxys calcitrans* L., (the stable fly), which are the two forms most common in the dwellings in Taytay, the remaining species collected have been sent to Europe for determination and the list will appear later.

Aside from the nuisance of having large numbers of flies always present in a town like Taytay and the menace to health which results from the likelihood of their carrying different infectious diseases, there is another phase of their presence which is not unworthy of consideration, especially as cases have already occurred with a certain degree of frequency in other places in the Philippines. I refer to the constant danger of infections by both adults and children with the larvæ of many of the *Sarcophagidæ*. Indeed, numbers of cases of myiasis in Americans in these Islands have been reported during the past ten years.

## BEDBUGS.

(*Cimex lectularius* L.) In only two instances were evidences of bedbugs noted in Taytay, both of these cases being found in houses in which high beds were used. It is quite evident that this pest is not at all serious in the town. In fact the majority of Filipino houses are quite free from it, owing to the kind of sleeping paraphernalia used by the general class: namely a *petate* or mat and a pillow. These articles are disturbed regularly at least twice a day and as they are frequently placed in the sun, there is little chance for bedbugs to breed in them. The open floors of Filipino houses and the ease with which they may be and are washed out, make lodgement for these insects very precarious.

## HEAD LICE.

(*Pediculus capitis* De Geer.) This insect is general in the Philippines, occurring on the heads of both young and adult females, but only very rarely on young males and then only on those who wear the hair long and in a condition of questionable cleanliness. The lice are not limited to any social class and children of the best families, by contact with schoolmates and servants, acquire them readily. They are looked

upon with abhorrence by the Filipinos and every means is employed for ridding the heads of those infested. The commonest method is that of individual removal, the hair, after a bath and a treatment with coconut oil, being examined carefully and both adult insects and eggs taken off and killed. The head louse was found in the usual degree of abundance in Taytay, the eggs being observed on the heads of girls on the street and occasionally on women who came to the hospital; and the usual process of removal was noted in the windows or doors of dwellings.

*Phthirius inguinalis* Leach appears to be unknown in Taytay, as frequent inquiry as to its presence or knowledge of it invariably elicited a negative reply. This seems equally true of *Pediculus vestimenti* L.

#### FLEAS.

A single species of flea was observed in Taytay. Specimens were taken from dogs and proved to be *Pulex serraticeps* Gerv. It is quite evident from the general appearance of the canines of this town that their lives are made miserable by the abundance of fleas which they harbor. Undoubtedly fleas from dogs cause some annoyance to the people and may prove a menace, but as long as dogs, half starved and ill-treated, form such a large factor in the community life of the Filipino, so long will the hope of a lessening of this menace be out of the question.

#### DOG TICKS.

(*Dermacentor* sp.) One or two of the dogs I examined closely were found harboring a few female individuals of *Dermacentor* sp., and from my experience with this species in other parts of the Philippines, I am led to believe that it is no less abundant in Taytay than elsewhere. From the facts that dogs live in the most intimate relation with man in these Islands and the habit possessed by these ticks, especially the males, of dropping off and migrating around habitations, they must certainly prove at least an annoyance to the human inhabitants. The nymphs also, of both sexes, before they attach themselves to canines, must occasionally attack the people of the house.

#### CARABAO LICE.

(*Hæmatopinus tuberculatus* Nitzsch.) Wherever the carabao is found in the Philippines the carabao louse may be found also. The few carabao examined in Taytay yielded their quota of this pest. The eggs as well as individuals in all stages of growth, may be taken from under the jaws, along the ventral and lateral surfaces of the neck and not infrequently in the ears. In many parts of the Islands they occur in great numbers and often cause sores upon the animal, from their bites and the efforts of the carabao to scratch the irritated part by rubbing against stones, trees, etc.

I mention this insect in this connection, though it does not directly cause annoyance to man, because of the possibility that its presence may have some bearing upon the spread of rinderpest or other diseases of the carabao.

In conclusion it may be stated that conditions with regard to the general prevalence of insects in Taytay do not differ essentially from those in most of the inland towns which I have visited in the Philippines. The life of the people is about the same as that in any other of a thousand Filipino communities and, to my mind, what would be true of Taytay with reference to hygienic and general sanitary or prophylactic measures would apply to most other towns.

At the end of this article a list is appended of the insects collected in Taytay, so far as they have been determined, together with a statement of their relative degree of prevalence. There is nothing new to report concerning those which have pathologic importance.<sup>3</sup>

I am of the opinion that the type of midden pit used at Taytay offers as serious a menace to health as the older plan of allowing pigs and chickens to be the general municipal scavengers, because under present conditions the flies which breed directly in the fæces and the mosquitoes found breeding in these pits, which may become partially filled with water, are certainly to be reckoned with as possible transmitters of typhoid bacilli, amœbæ, and filariæ; while the chance of infestation with parasitic worms through the media of pigs and chickens seems much more remote. If it were possible to have the midden pits nearly filled with water upon the surface of which a few tablespoonfuls of petroleum or crude carbolic acid were poured weekly, then all danger of flies or mosquitoes breeding in them would be removed; but at best this would be practicable only in the rainy season and the work would require a better system of inspection than that furnished by the average municipal health officer.

#### LIST OF MOSQUITOES AND OTHER INSECTS TAKEN AT TAYTAY.

##### DIPTERA.

##### CULICIDÆ.

##### *Anophelinae.*

1. *Myzomyia rossii*<sup>4</sup> Giles, very common, taken in all streams where green algae were growing; the undoubted transmitter of malaria in this town.

<sup>3</sup> *Loc. cit.*; also Ashburn and Craig, *Ibid.*, Sec. B, (1907), 2, 1.

<sup>4</sup> *Myzomyia rossii* Giles has been previously noted by me and also by others under the name *M. ludlowii* Theob., but during my stay in London last year I proved to my satisfaction that the Philippine species is none other than *M. rossii*. Professor Theobald told me that he had reached the same conclusion and that he expected to note it in his next volume on the Culicidæ. I examined several hundred specimens of *M. rossii* in the British Museum and compared them with an even larger number from the Philippines and could discover no essential differences.

2. *Myzorrhynchus barbirostris* V. d. W. Very rare, two specimens.
3. *Stegomyia persistans* Banks. The day-flying "tiger mosquito" a universal breeder in practically every house in Taytay, a great annoyance.
4. *Stegomyia samarensis* Ludl., rare, taken only twice.
5. *Culex concolor* Desvoidy, rare, a half dozen specimens bred from water of stream at Pinagsalaan well.
6. *Culex fatigans* Wied., not common, bred in two midden pits. May be more common in this town in the rainy season as it is in Manila and other towns.
7. *Culex microannulatus* Theob., rather common, found associated with *Myzomyia rossii*.
8. *Culex taytayensis* Banks n. sp.,<sup>5</sup> not common, found in streams and shallow wells as shown on map.
9. *Culex argentinotus* Banks n. sp.,<sup>5</sup> very rare, only three specimens, bred from stream at Pinagsalaan.
10. *Banksinella luteolateralis* Theob., rather common, specimens bred from stream at Pinagsalaan.

## MUSCIDÆ.

11. *Musca domestica* L., extremely abundant in-doors and out-of-doors.
12. *Musca* sp., very abundant, a species much larger than *domestica*. This with other Diptera sent to Europe for identification.
13. *Stomoxys calcitrans* Linn., very common, a great annoyance to horses especially at the railroad station where many vehicles congregate.

## HEMIPTERA.

## CIMICIDÆ.

14. *Cimex lectularius* Linn., apparently rather scarce in Taytay, specimens taken in only two houses.

## PEDICULIDÆ.

15. *Pediculus capitis* De Geer, common.
16. *Hæmatopinus tuberculatus* Nitzsch, common as a parasite on carabao.

## SIPHONAPTERA.

## PULICIDÆ.

17. *Pulex serraticeps* Gerv., common, found on all dogs examined, not seen in houses but evidently a limited source of annoyance to man here.

## ACARINA.

## IXODIDÆ.

18. *Dermacentor* sp., not common on dogs, found on several of these animals examined.

<sup>5</sup> The description of these two species will appear in this JOURNAL, Sec. A, 4, No. 6, during the present year.





## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### VIII. VITAL STATISTICS.

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By PAUL CLEMENTS.<sup>1</sup>

(From the Bureau of Health.)

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As will be seen from the accompanying map (Plate III), the extreme dimensions of the town of Taytay are approximately a kilometer from north to south, and, including the extension of the town along the roads to Cainta and Antipolo, about  $1\frac{1}{2}$  kilometers from east to west. In this area there are over twelve hundred occupied dwellings on twenty-five streets. The streets have no names and the houses are not numbered, although the town is divided into four barrios—Dolores, San Juan, San Isidro, and Santa Ana. It was soon found that knowing the name of the barrio in which a patient lived was of little assistance in locating him afterwards in case he failed to return to the clinic. It was also realized that the official returns of the census of 1903, already six years old, did not afford a reliable foundation upon which to base statistics. The listing and enumeration of the population was therefore undertaken both for the purpose of procuring information which would enable us to trace patients and of ascertaining as exactly as possible the size of the population with which we were dealing. In the course of preparing this census, however, it was found that many cases of disease came to our notice in this way which would otherwise have escaped us and we regretted afterwards that it was not undertaken at the very beginning of the work in the town and pushed to completion before other studies were begun.

Our census deals only with the main portion of the town, and does not include the barrio of San José which is located about 2 miles to the southeast. Our results indicate a slight gain in population since 1903; the district covered by the census at that time had a population of 5,840, and has at present one of 6,094.

The excess of females shown by the census of 1903 is still maintained. In that year there was an excess of 163 females in a population of 6,067 for the entire municipality. The present census in the

<sup>1</sup> Medical inspector, Bureau of Health, Manila, P. I.

area covered shows an excess of 162 females in a population of 6,094. In spite of this fact, the age group, "under 5 years" shows a male excess of 39, which agrees with the birth records of the town of the past two years and which also show an excess of males. The excess of females is found principally in the groups "5 to 9 years," "15 to 19 years," and "20 to 24 years." In the groups "10 to 14 years" and "25 to 29 years" the sexes are almost exactly equal, while in all the groups falling between the ages of 30 and 60 a slight excess of males is shown. The excess of females in the groups "15 to 19 years" and "20 to 24 years" is probably to be explained to some extent at least, by the more pronounced tendency in the male to emigrate between those ages in search of better educational facilities, or of better opportunities of gaining a livelihood. This tendency would not apply to the group "5 to 9 years." In this group there are 347 females to 300 males, an excess of 47, which almost exactly coincides with the group "under 5 years" of 1903, in which there were 443 females to 399 males, or an excess of 44. The explanation is probably to be found in an upward swing in the female birth rate during the early half of the present decade. The total present population and its distribution in sex and age groups are shown in Table 1, and the percentage of distribution in Table 2.

TABLE 1.—*Population of Taytay by age and sex groups.*

	Less than 1 year.	1 year.	2 years.	3 years.	4 years.	5 to 9 years.	10 to 14 years.	15 to 19 years.	20 to 24 years.
Males .....	88	115	108	116	88	300	245	242	225
Females .....	103	110	112	90	76	347	247	313	305
Total .....	186	225	220	206	164	647	492	555	530

	25 to 29 years.	30 to 39 years.	40 to 49 years.	50 to 59 years.	60 to 69 years.	70 years and over.	Un- known.	Total.
Males .....	268	378	233	157	111	99	198	2,966
Females .....	271	363	209	138	121	84	239	3,128
Total .....	539	741	442	295	232	183	437	6,094

TABLE 2.—*Percentage distribution by age and sex groups.<sup>a</sup>*

	Less than 1 year.	1 year.	2 years.	3 years.	4 years.	5 to 9 years.	10 to 14 years.	15 to 19 years.
Males .....	1.46	2.03	1.90	2.05	1.55	5.30	4.33	4.27
Females .....	1.82	1.94	1.98	1.59	1.34	6.13	4.37	5.53
Total .....	3.28	3.97	3.88	3.64	2.89	11.43	8.70	9.80

<sup>a</sup> Calculated on 5,657 persons of known ages.

TABLE 2.—Percentage distribution by age and sex groups—Continued.

	20 to 24 years.	25 to 29 years.	30 to 39 years.	40 to 49 years.	50 to 59 years.	60 to 69 years.	70 years and over.
Males .....	3.97	4.78	6.68	4.11	2.77	1.96	1.75
Females .....	5.39	4.78	6.41	3.69	2.44	2.14	1.48
Total .....	9.36	9.51	13.09	7.80	5.21	4.10	3.23

	Number.	Per cent.
Under 5 years .....	1,001	17.69
From 5 to 9 years .....	647	11.43
From 10 to 19 years .....	1,047	18.50
From 20 to 29 years .....	1,069	18.89
From 30 to 39 years .....	741	13.09
From 40 to 49 years .....	442	7.81
From 50 to 59 years .....	295	5.21
From 60 to 69 years .....	232	4.10
From 70 years up .....	183	3.23

The register of births and deaths kept by the municipality is the only available source of data on these points. The register of deaths is believed to be complete, and as accurate as circumstances permit. A death certificate is required as a necessary preliminary to interment. With the exception of the most important fact in connection with a death, its cause, the required data are within the ability of a layman to ascertain. Previous to August, 1907, there was no physician in the town of Taytay, and it is in consonance with this fact that during the early months of that year only eight causes are assigned for all the deaths which occurred, viz; eclampsia, phthisis, fever, senile debility, difficult labor, cerebral congestion, colic, and fracture. For the latter part of 1907 and for the entire year of 1908, the causes of death assigned in the records are probably a much nearer approximation to the truth. When it is remembered, however, that in the great majority of cases in the town the physician is not called except after death and then only because he is required for the purpose of executing a death certificate, that the information to be obtained from the family and friends of the deceased is vague and unsatisfactory, and that an autopsy is practically impossible to obtain, it will be seen that even the cause of death as assigned by a competent physician frequently at best can be only approximately correct.

The registered deaths are 170 for 1907, or 27.91 per thousand, and 277 for 1908, or 45.42 per thousand. This considerable difference between the two years is largely accounted for by the absence of smallpox during 1907, and its presence during 1908, when the number of deaths from this disease was 76. Excluding smallpox, we find 201 deaths, or 33 per thousand for 1908. We feel safe therefore in stating



that, exclusive of epidemics, the death rate for the town is between 27 and 33 per thousand.

In view of the unsatisfactory nature of the causes assigned in the records for deaths occurring during 1907, no attempt will be made to draw conclusions from the data for that year other than those which may be obtained from the age distribution. This is shown in Table 3. The percentage distribution, compared with the percentage distribution of population in age groups, is shown in Table 4.

TABLE 3.—*Distribution of deaths by age groups.*

	Less than 1 year.	1 year.	2 years.	3 years.	4 years.	5 to 9 years.	10 to 14 years.	15 to 19 years.	20 to 24 years.	25 to 29 years.	30 to 39 years.	40 to 49 years.	50 to 59 years.	60 to 69 years.	70 years and over.	Total.
1907.....	39	24	17	4	1	6	4	7	5	5	17	8	9	12	12	170
1908 <sup>a</sup> .....	51	8	21	16	5	12	2	4	1	13	20	13	3	9	20	201
1908 <sup>b</sup> .....	68	15	39	27	17	21	4	4	4	13	20	13	3	9	20	277

<sup>a</sup> Excluding smallpox.

<sup>b</sup> Total.

Rate per thousand per year:

1907 .....	27.91
1908, excluding smallpox .....	33.00
1908, total .....	45.42

TABLE 4.—*Percentage distribution of deaths, by age groups, compared with distribution of population.*

	Less than 1 year.	1 year.	2 years.	3 years.	4 years.	5 to 9 years.	10 to 14 years.	15 to 19 years.
Population .....	3.28	3.97	3.88	3.64	2.89	11.43	8.70	9.80
Deaths for 1907.....	22.94	14.12	10.00	2.85	0.59	3.53	2.35	4.12
1908, excluding smallpox .....	25.37	3.98	10.49	7.91	2.48	4.47	0.99	1.99
1908.....	24.55	5.41	14.08	9.75	6.13	7.58	1.44	1.44
Registration area, United States, 1907.....	19.08	4.01	1.74	1.11	0.79	2.22	1.53	2.67
Total .....	26.74							

	20 to 24 years.	25 to 29 years.	30 to 39 years.	40 to 49 years.	50 to 59 years.	60 to 69 years.	70 years and over.
Population.....	9.36	9.51	13.09	7.80	5.21	7.06	3.23
Deaths for 1907.....	2.94	2.94	10.00	4.70	5.29	7.06	7.06
1908, excluding smallpox .....	1.99	6.46	9.95	6.46	1.49	4.47	9.95
1908.....	1.44	4.69	7.22	4.69	1.08	3.25	7.22
Registration area, United States, 1907.....	4.05	4.29	9.17	9.29	9.89	11.76	18.17

The proportion of deaths occurring under one year is somewhat larger than occurs in the United States (Registration Area, 1907), 22.94 for 1907, and 24.55 for 1908, as against 19.08 for the United States. The excess is more marked in the age groups corresponding to childhood, the

group "under 5 years" showing 50 and 59.92, respectively, against 26.74 for the United States. The difference from 10 to 39 years is not marked. The proportion of the death rate occurring in the groups above 40 is decidedly less.

Table 5 exhibits the age distribution of deaths during 1908 attributed to the more important causes, numerically speaking. The most noticeable feature is that two-thirds of the deaths attributed to chronic bronchitis occurred between the ages of 15 and 50. Almost certainly the majority of these were due to tuberculosis. The writer believes that 25 deaths per year from pulmonary tuberculosis would be much nearer the truth than 10, which is the number assigned in the records. It is also much more nearly in accord with our estimate of 50 to 60 cases of pulmonary tuberculosis existing in the town at the present time.

TABLE 5.—Age distribution of deaths in 1908.

	Less than 1 year.	1 year.	2 years.	3 years.	4 years.	5 to 9 years.	10 to 14 years.	15 to 19 years.	20 to 24 years.	25 to 29 years.	30 to 39 years.	40 to 49 years.	50 to 59 years.	60 to 69 years.	70 years and over.	Total.
Chronic bronchitis.....			1					1	1	3	8	4		3	5	26
Infantile convulsions.....	33	3	1	2		1										40
Dysentery.....	2		10	5	2	4					1				1	25
Fever infection.....						1		1								2
Grippe.....							1			1						2
Malaria.....			1			1		1		1						4
Typhoid.....							2			2	2	1			1	8
Undetermined.....			2	2						1		1	1	3		10
Gastro enteritis:																
Acute.....	2	1	1	2		1										7
Chronic.....	1	2	3	3	1											7
Smallpox.....	17	7	18	11	12	9	2									76
Pulmonary tuberculosis.....					1				1	1	4	3				

The deaths attributed to infantile convulsions merit an age distribution in smaller groups, as follows:

Under 30 days.....	16
Under 1 to 2 months.....	4
Under 2 to 3 months.....	3
Under 3 to 4 months.....	2
Under 4 to 5 months.....	1
Under 5 to 6 months.....	1
Under 6 months to 1 year.....	6
Over 1 year.....	7

The seven deaths in children over one year of age, and probably most of those between three months and one year, were probably due to other causes.

From the statistics it would appear that smallpox was entirely an affection of childhood. This probably resulted from the fact that the entire existing population of 1905 was vaccinated against smallpox and that this was repeated in March of the present year by representatives of the Bureau of Health; in addition, vaccinations were performed yearly by the local health officer.

The birth register of the town is not so reliable as that of the deaths, the former being merely a copy of the baptismal records of the parish church; therefore, probably a small percentage of the births escape registration. This percentage is, however, small, as practically the entire population is Catholic and religious observances occupy a large place in the daily life of the people. In regard to baptisms, we were told that this rite is customarily performed from thirty to forty days after birth, and is the first occasion on which the mother leaves the house after her confinement.

The registered births are 114 males and 103 females for 1907, and 203 males and 164 females for 1908, the respective rates per thousand being 35.60 for 1907, and 60.22 for 1908.

## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### IX. GENERAL SANITARY CONDITIONS.

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By PAUL CLEMENTS.<sup>1</sup>

(*From the Bureau of Health.*)

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In Taytay the majority of the inhabitants enjoy what would be regarded as modest comfort according to Filipino provincial standards; comparatively few are wealthy and the poorer people do not suffer any hardships. The principal occupations of the inhabitants are agriculture and fishing. Many follow both vocations according to the season. At present, there are no Americans or Europeans and only two Chinese residing in the town, and it would appear that the conditions of life have not been much modified by contact with foreign influence. For this reason, a medical survey of the town should be fairly typical of this section of the Philippine Islands.

The great cholera epidemic of 1882 is said to have started at Taytay, and since that time the town has had a bad reputation from a sanitary point of view. Taytay also suffered severely in the cholera epidemic of 1902, and again in 1905, though perhaps not more than the other provincial towns of central Luzon.

A small portion of the town, including the church, schoolhouse, and municipal building, occupies a low foothill of the Antipolo Range; much the greater part, however, is built on an alluvial plain with a gradual slope toward the south, in the direction of the Laguna de Bay. (Plates X and XI.) Two principal streams run through the town, their beds lying from 6 to 10 feet below the level of the plain. They carry a variable volume of water during the rainy season and early months of the dry season, but during the latter months of the dry season they are without water except for disconnected pools along their courses. Two smaller tributary streams also assist in the drainage of the town. Observations of the level of the water in a number of wells made during the latter part of the dry season indicate that the ground water reaches to within about 12 feet of the surface when it is at its lowest level.

The average dwelling in Taytay is a structure having a frame of which

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the heavier parts are of wood and the lighter parts of bamboo, the roof and sides being of nipa thatch, and the floor of split bamboo-lath, laid with an interval of 3 or 4 millimeters. Ample ventilation is provided by these intervals in the floor, and by generous windows which are closed at night and during storms by blinds of bamboo or of nipa thatch on a bamboo frame. The eaves project usually about half a meter. Direct sunlight rarely penetrates into the house. This structure consists usually of two rooms which are frequently built as separate units. The entrance is at the side of the rear room. A portion of the front room is partitioned off as a closet in which clothing and bedding are kept. Behind the rear room is a small kitchen and a *batalan*, a small roofless porch, where the food is prepared and the water jars are kept. The rooms of such a house are approximately square, the lineal dimensions being  $3\frac{1}{2}$  or 4 meters. The floor is from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  meters off the ground, the entire structure being supported on wooden posts, 15 to 20 centimeters thick, which are set into the ground and reach to the frame of the roof, passing through the corners of the room from floor to roof. The distance from floor to roof is often not more than 2 meters, and sometimes less.

A small percentage of the houses, usually occupied by newly married couples of the poorer class, are smaller and of lighter construction than that described. These consist only of a single room and a kitchen, the frame and supports being entirely of bamboo. There is usually no ceiling and the inside of the roof is begrimed by the smoke of the kitchen fire, chimneys being unknown. From the roof frame is hung a shelf or two, a little higher than one's head, where various articles are put to be out of the way. Strings of garlic, peppers, ears of maize, dried fish, as well as nets or other articles used by the owner in his work, are hung also from the roof frame.

There is usually not much furniture. The bed consists of a mat spread upon the floor at night and a pillow or two. The mosquito net is almost unknown. There are one or two wooden benches, several chests for clothing, and numerous baskets of various shapes and sizes. In the kitchen one or more *calans* (or wooden frames used for holding pots in cooking) are found, and a small portable fireplace of native pottery, on the upper rim of which are three knobs that support the rice pot or the frying pan, the latter being of the same material as the *calan*. A few water jars and a small number of dishes complete the inventory of the household belongings of the average native of Taytay.

#### FOOD.

The chief component of every meal is boiled rice. This may be accompanied by a stew of fish and vegetables, or of vegetables alone, or by a dish of fried fish. Meat is a rarity for the poor inhabitant of Taytay. Such small amounts as are eaten consist generally of pork or fowl. Ginger, which grows wild in many parts of the Philippines, is



much used as a condiment, as are also garlic and peppers. Tuberous and other starchy roots are used to some extent, but principally as a substitute for rice, when the latter is scarce. Almost the only variation in the food from day to day consists in the use of different kinds of vegetables in the seasoning of the stew. The kitchen work is very light, compared with the standards of more highly civilized countries. There is only the washing of the rice and vegetables and the cleaning of the fish or fowl, before the pot goes on the fire, and only a very limited number of dishes to clean afterwards.

When the meal is ready, the rice is turned out upon a large platter, usually of crude porcelain but sometimes of wood, or, occasionally, upon a banana leaf, and the seasoned stew is poured into another dish or perhaps served in the pot in which it was cooked. Both are then placed on the floor or on a low table (about 15 centimeters in height). The family gathers in a squatting position around this table, or around the platter and dish on the floor. Each one takes with his fingers a small portion of rice, which is worked with the finger tips into a bolus, dipped into the stew and then put into the mouth. From time to time a piece of fish or other tidbit is taken from the stew. When the meal is finished, no further toilet is made other than wiping the fingers and mouth on a bit of rag.

The waste from the kitchen such as fish scales, feathers, entrails, vegetable parings, etc., are thrown upon a rubbish heap, and such parts as escape the attentions of the family pig are burned, sometimes daily, sometimes at longer intervals. The slops from the washing of food, dishes, and vessels, are merely poured through the crevices in the kitchen floor; and this practice results in the universal presence of a puddle of foul, stagnant mud underneath the kitchen.

#### WATER.

There are a number of wells within the town, the water of which is used for various domestic purposes, but not for drinking. Drinking water is usually obtained from springs and wells in the fields, about 200 meters from the outer limits of the town. The only provision for drawing water is an empty petroleum can and a rope. A length of bamboo or a wooden beam is placed across the mouth of the well, and the drawer stands with one foot on this beam and the other on the curb for greater convenience in pulling up the can. Women frequently go for water with an earthen pot, which is carried on the head; but a man will usually carry two petroleum tins swung from a stout piece of bamboo across the shoulder. When the house is reached, the water is emptied into the jars. There are separate jars for drinking water. Each jar, whether the water contained in it is destined for drinking or for other uses, is provided with a wooden cover and with a coconut

shell for a dipper, which either lies on the lid, or floats on the surface of the water within. Water is dipped out with this shell, the fingers grasping its edges, and being placed in the water with each dip.

#### CLOTHING.

Children of both sexes from 1 to 4 years of age or even older, are seen frequently with no clothing whatever, or with merely a thin shirt reaching only to the navel. Older boys add to the shirt a pair of drawers, secured at the waist with a draw string. Girls from 4 or 5 years of age to that of puberty, wear a single garment—a chemise of cotton print reaching to the knees. From puberty onward, the costume of the women consists of the short *camiseta* or chemise, which is sleeveless and low-necked, and reaches to just below the waist line; a skirt, or perhaps two skirts; the *camisa* or waist of *sinamay* material with flaring sleeves which come to the elbow; and the *pañuelo* or neckerchief of the same material. The *camisa* and *pañuelo* are usually starched to the last degree of stiffness, and are taken off at night or when the wearer is engaged in household tasks. Large boys and men wear a shirt and drawers, the latter, and sometimes also the former, being made of cotton cloth. Frequently the shirt is of *sinamay* and then an undershirt of cotton knit goods is usually worn. Both sexes frequently go barefooted, but some wear *chinelas*—loose slippers with a leather sole and a cloth toe-piece—in dry weather, and *sucros* or wooden clogs in wet weather.

When fishing or cultivating rice, the workman is frequently in mud which reaches up to his knee or mid-thigh.

Preparations for retiring are easily made. Mats are unrolled and spread on the floor, pillows put down, the windows and doors closed, and the family lie down wholly or partly dressed. Separate clothing for night wear is not used. With the closing of windows and doors and the covering of the open spaces in the floor with mats, the ventilation of the house at night is materially reduced; however, it is practically impossible in houses of native construction to cut off all ventilation.

#### BATHING AND WASHING.

The washing of clothing and bathing of the person are frequently performed in conjunction. The site of preference is a shallow spot in the margin of a stream whenever there is one not too distant. The housewife carries the soiled clothing to the edge of the stream in a wide, shallow wooden basin balanced on her head. Arriving at the stream she puts down her load, loosens one of her skirts at the waist and secures it just under the arms and across the upper part of the breasts, from which it reaches to her knees, and then removes the remainder of her clothing. She selects a smooth stone, which reaches just above the surface of the water and squats in front of it. The

clothes are soaked for a moment in the water and then piled conveniently at hand. She then selects a piece from the pile, soaps it, and laying it upon the stone, beats it smartly with a piece of wood shaped for the purpose, dipping the latter from time to time into the water, until all the soap is finally removed from the garment. The piece is then wrung out and placed in the basin, and another is taken.

The women usually do their washing in groups and are accompanied by the smaller children of the family of both sexes, who, up to 8 or 9 years of age, play in the water, nude. When all the clothing is washed, the children are also scrubbed, water being poured over the head and shoulders from a coconut shell. The women then proceed to bathe themselves in the same way, rubbing the body with the hands or with a fold of the skirt. A shampoo with *gogo* which much resembles soap-bark, usually accompanies the bath. When the bath is finished, the *camisa* is put on, then a dry skirt, under cover of which the wet one is dropped about the ankles, and the dressing may then be finished at leisure.

If there is no stream convenient to the house, the washing is done near a well, a can of water being drawn and poured into the basin, the clothing piled on a board or stone until the washing is completed, then the soapy water is poured on the ground, and the clean clothes carried home in the basin. Here, too, the woman bathes herself after washing the clothes. From this habit of bathing and the spilling of the water, as it is drawn from the well and poured into the vessels, it results that the ground around the mouth of the well is practically always sloppy and muddy. Men bathe in the same manner, keeping on the drawers or tying a garment around the middle as a loin cloth.

Besides the bath, almost the only care taken of the person is that given to the hair, and a comb of hard wood is almost the only toilet article used. The women comb the hair very carefully and fasten it in a knot at the back of the head or back of the neck. Coconut oil is universally used as a dressing for the hair. Toothbrushes, hairbrushes, mirrors, etc., are not used among the lower classes. Washing the face and hands is considered necessary only when there is a visible soiling. Head lice are evidently common, judging from the frequency with which one woman is seen inspecting another's hair.

#### NIGHT SOIL.

Of 1,299 houses in Taytay which were inspected and the conditions found noted, 591, or 45.4 per cent, were without provision of any description for the disposition of night soil, while 342 houses, or 26.3 per cent, were provided with outhouses. The latter are small structures of bamboo and nipa, usually raised to the level of the house, and 8 to 10 meters distant from it. Two hundred and sixty-six of these outhouses

are connected with the house by a bamboo bridge (Plates XIII & XIV); 76 are without such connection. These privies have no seats; the user squats over a hole in the floor, and the night soil falls through to the ground. The space under the floor is inclosed usually, but a hole large enough for the pig to get through is left invariably at the back of the inclosure. The result is that there is no accumulation—the pig acts as scavenger. On 433 premises, or 33.3 per cent, pits were found which were intended to serve as dry-earth closets. These, however, are of recent introduction, having been dug in January of the present year, by direction of the local health officer, at a time when there was a small outbreak of cholera in the adjoining town of Cainta. More than half of these pits are not used now, the people having resumed their old habits. Sixty of those still in use are provided with a covering, and 8 of these have a shelter in addition. Eleven of the raised outhouses have pits underneath and there are 56 premises where outhouses and pits exist separately. Of the entire number, 81 may be said to fulfill satisfactorily the function of a dry-earth closet.

Those who have neither outhouses nor pits either use a vessel in the house which is emptied early in the morning at any convenient place, or, if they live near the edge of the town, they go into the nearest clump of bushes. Urination at home is frequently performed through the kitchen floor. Away from home, the women will squat, with the skirts arranged in as wide a circle as possible; men simply go up to and face the nearest bush, tree, or wall.

The figures given above with regard to the disposition of fæces may be tabulated as follows:

Number of houses to which the data refer	1,299
Number of houses with no provision for disposal of night soil	591
Number of houses with raised outhouse and pit in connection	11
Number of houses with raised outhouse and separate pit	56
Number of houses with raised outhouse alone	275
Number of houses with simple pit	298
Number of houses with pit with cover	60
Number of houses with pit with cover and roof	8

#### THE SURROUNDINGS OF THE HOUSE.

The average size of the lots upon which the houses are built may be estimated at 500 square meters, though there are sections of the town in which the lots are much smaller than this. The house is usually built on one corner of the lot, so that in most instances there is ample space between the houses. Occasionally a small number of houses are grouped together, being only about a meter apart. There are no "back alleys." The streets vary from 5 to 8 meters in width. Little work is done on them, and the middle of the street is usually ankle deep in dust in dry weather, and in wet weather still deeper in mud, there being no storm-water drainage except the little provided by the natural slope of the land.

The principal defects within the yard are the mud puddle under the kitchen, already alluded to, and the accumulations of filth due to the keeping of animals. A good deal of litter accumulates, such as fallen leaves, dead weeds, rice hulls, straw, shavings from bamboo work, etc., and this is swept into a heap and burned out of doors daily or whenever the weather permits. Into this fire goes also such solid kitchen waste as escape the attention of the family pig.

Almost every family has one or more dogs, a few chickens, and a pig. The dogs and chickens take care of themselves and contribute comparatively little to unsanitary conditions. The pigs also run loose, except for a month or two before slaughtering, when they are confined in a sty and are well cared for. A small pig, intended to be consumed by the owner and his family and friends, will frequently be kept in a corner of the kitchen. It is, however, the owners of carabaos and horses who live in the most unsanitary surroundings to be found in the town. The carabaos are in the fields by day, either at work, or grazing, but at night the timid owner wishes them under his eye or within hearing. The same may be said of the comparatively small number of horses in the town, which are principally used in traffic with the near-by towns of Pasig and Antipolo. The carabao usually lies in a corner of the yard but a small shed with feed trough and board floor is usually built for the horse. The accumulations of dung, urine, feed waste, etc., are allowed to remain until at times the yard becomes impassable.

#### MARKET.

The market building is merely a large thatched shed, with a dirt floor. There are no walls, the front opens upon the street, the back upon a vacant space, while the sides are to some extent closed in by the walls of adjoining buildings. Here are to be seen each morning considerable quantities of vegetables, some fruits, eggs, a few fowls, and pork. A few of the regular venders have large tables on which their produce is exhibited. There is always, however, a considerable contingent of occasional venders of small quantities of produce with two or three baskets or a mat spread on the ground. From 6 to 7 o'clock in the evening, when the day's catch of fish comes in, is also a lively hour. Nothing but fish is seen in the market at this time.

There is no abattoir. It is rare that any animal except a hog is slaughtered, and this is usually done on the premises of the owner.

#### SICKNESS AND INFANCY.

Although there is now a native physician resident in Taytay, the majority of the people when they are sick do not call him, but either do without medicines, or prefer the services of an "herb doctor," of whom there are a number in Taytay. Whether this is due to indifference, or to lack of confidence, or to inability or unwillingness to pay the



scale of charges usually exacted by a native physician, I am unable to say. There is some fear of "drug store" medicine, as contrasted with roots, barks, etc., which are obtained in the neighborhood, due to the idea that the former are poisonous and the latter not. Nevertheless, in about two months, more than a thousand persons voluntarily presented themselves at our clinic, and there were numerous requests to see those who were too sick to come.

The houses afford no better accommodations, and no more comfort, for the sick than for the well. The patient lies on a mat on the floor, usually with a cotton blanket over him. He is entirely dependent upon the family and neighbors for attention, and gets plenty of it such as it is, but much of it is misdirected. The prevalent idea that currents of air are not good for the sick causes them to shut up the house as tight as possible. Neither light nor air is admitted. The room, and indeed the entire house, is filled with sympathizing neighbors at all hours of the day and night if the patient is suffering from an acute and dangerous disease. Sick diet consists of rice cooked very soft, or of the broth strained from this. This is fed to the patient as long as he can swallow, and, needless to say, often to his detriment. The "herb doctor" acquires through experience a knowledge of the symptoms of the commoner diseases of the locality, and of some of the properties of medicinal plants of the neighborhood. The latter are known to furnish reliable purgatives, counterirritants, and sedatives, and it is claimed that some of the plants have abortifacient and antiperiodic properties.

Obstetrics is practiced as a separate art by old women who are ignorant of the first principles of cleanliness. Luckily, few abnormal labors occur. A length of cloth is often passed around the body of the parturient and traction made on the ends with the idea of assisting in the expulsion of the child. After birth, the cord is cut and tied, a pad of rags, not always of the cleanest, is secured over the umbilicus by a band, and the child is wrapped in a cloth. The mother does not get up for a week, and leaves the house for the first time when the child is baptized; that is, thirty to forty days after confinement.

The mother practically always nurses her infant. The latter is usually not weaned until it is 2 years old, and sometimes not until it is 3. It is not uncommon to see two children of different ages nursing from the same mother. On the other hand, the infant's diet is not breast milk alone. Rice feeding is usually begun at three or four months of age and perhaps causes the enlargement of the abdomen which is so strikingly noticeable in the children.

Funerals usually take place either in the early forenoon or late afternoon and within twenty-four hours of the death. Delay only occurs when some member of the family is absent, and there is hope of his being able to be present in a few hours or a day more. All the details of the burial are attended to by relatives or friends of the deceased. The body is

washed, dressed in its best clothing, and wrapped in a mat which serves as coffin or winding sheet. The body is carried to the grave upon a sort of hammock constructed of bamboo slats and slung from a bamboo pole on the shoulders of two men, who are relieved in relays. After the funeral, those present return to the house of the deceased where a funeral feast is prepared.

#### THE BETTER CLASS OF INHABITANTS.

Such are the conditions under which the greater part of the population of Taytay undergo their daily existence. The changes which take place as we climb the rounds of the social ladder are much more in the direction of better material possessions than in that of improved habits and genuine comfort. Improvement is first shown in the construction of the house, in the proportion between the amount of wood and lighter materials employed, the height of doors, etc. While in the more ordinary houses the supports are the sole portions that are of wood, each advance in material well-being is marked by the additional use of wood in construction: first the floor joints and principal members of the roof frame, next the steps and the door and window frames, then the sides, until the entire house, except the thatched roof and the floor of bamboo lath, is constructed of wood. The final dignity of stone foundation, floors of wide smooth boards, and roof of galvanized iron, is attained by only one house in Taytay.

So it is also with regard to furniture. The possessor of a few chairs, a table, and a small mirror has climbed a step or two in the social scale, and when the principal room is lined with chairs, and there is a bed (reserved for distinguished visitors), a clothes press of hardwood, and sufficient dishes to set a table, the owner is likely to be one of the *principales*.

An individual's social station is indicated also fairly accurately by his clothing. On Sundays and gala occasions, the well-to-do man will appear in public in just such clothing as is worn by his white acquaintances, the ordinary clothing serving for underwear. However, just as soon as he is at home and in private, he removes the outside clothing and again appears in shirt and drawers. The ladies of the family do not change the style of their clothing, but use much handsomer material. The younger ones appear in gay colors, the older ones in more sober ones.

Among these more well-to-do natives in Taytay very little change will be found in the kitchen, perhaps nothing more than an increase in the number of fireplaces. The ordinary diet remains the same except that fish occupies a more prominent place, and meat appears oftener. The hygienic conditions outside of the house are likely to be worse, due to the ability of the occupant to purchase and keep a larger number of animals.



# MEDICAL SURVEY OF THE TOWN OF TAYTAY.

## X. ANIMAL PARASITES OF THE INTESTINE.

By PHILIP E. GARRISON,<sup>1</sup> RICARDO LEYNES, and ROSENDO LLAMAS.

TABLE 1.—*Summary of findings.*

Examinations and infections.	Num- ber.	Per cent.	Examinations and infections.	Num- ber.	Per cent.
Persons examined.....	1,000		Persons infected with—		
Persons infected .....	959	95.9	<i>Amoeba</i> .....	27	2.7
Persons infected with—			Ciliates .....	2	0.2
<i>Ascaris</i> .....	829	82.9	Flagellates .....	55	5.5
<i>Trichuris</i> .....	770	77.0	Encysted protozoa .....	11	1.1
<i>Hookworms</i> .....	116	11.6	Total infections .....	1,821	182.1
<i>Strongyloides</i> .....	7	0.7	Intestinal worms alone <sup>a</sup> .....	1,726	172.6
<i>Oxyuris</i> .....	4	0.4			

<sup>a</sup> Microscopic examination of the fresh sputum of 110 persons and of the centrifuged urine of 26 persons respectively failed to show ova of *Paragonimus* and of *Schistosoma*. There was no clinical evidence of these infections.

## INTRODUCTION.

The inauguration of the work at Taytay offered an opportunity for the first time to determine the frequency of infection with intestinal parasites in a normal and fairly typical Filipino community. Practically all of our previous knowledge of this subject in the Philippines has been based upon the results of work done at Bilibid Prison, in the hospitals of Manila, and in military organizations. From these results certain tentative deductions have been made with regard to the rates of infection with the various parasites in question which might be expected in the Philippine population as a whole. It is our purpose in presenting the results found at Taytay to consider in conjunction with them these earlier figures and to draw such conclusions as may be warranted regarding the true significance of these infections in the Philippines in the light of our additional knowledge concerning them.

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We believe that the real importance of intestinal infections with animal parasites, and especially with hookworms, as a factor in Philippine hygienic and industrial conditions is still far from being satisfactorily determined and that it will not be determined with a precision and definiteness in harmony with the present standards of medical science until much more work has been done in the provincial districts themselves where the people can be studied under representative conditions. We believe that already deductions have been made with regard to the medical importance of certain parasites which go far beyond what the actual known facts will warrant and in presenting this latest contribution to our knowledge of these infections we shall limit ourselves to such conclusions as appear justifiable upon grounds positively ascertained by the results of work actually done in the Islands.

In the studies performed at Taytay as in the work done at Bilibid Prison, only one cover-glass preparation of the stool was examined in the great majority of cases and it is realized that light infections were probably missed frequently. Most of the stools were passed after a dose of epsom salts though many were collected from people without such previous treatment. The great majority of the specimens were examined the same morning they were passed, usually within two or three hours, but frequently a specimen would be kept over night before being brought to us, necessitating care in order to avoid confusing the embryos of hookworms and *Strongyloides* and undoubtedly reducing somewhat the number of infections found with intestinal protozoa. The number of such old specimens examined was not sufficiently great however to account in any great measure for the marked disparity between our findings at Taytay and those of ourselves and of other workers elsewhere with regard to the frequency of intestinal *amæbæ* and flagellates in the Philippines.

In addition to the usual clinical record kept of all cases; patients infected with hookworms and with *amæbæ* were specially studied and notes made of the presence or absence of symptoms arising from these infections.

The distribution of the various infections in different ages and in the two sexes offers some points of interest.

#### AGE AND SEX DISTRIBUTION.

The prevalence of infections in males and in females and in various age groups is shown in Tables 2, 3, 4, and 5.

In general the age and sex distribution agrees with that which has been found in other localities.

Any significant differences in the frequency of infection in the sexes or in the different age groups will be considered under the head of each parasite separately.



## SEX DISTRIBUTION.

TABLE 2.

	Number examined.	Infected.		Ascaris.		Trichuris.		Hook-worms.		Strongyloides.	
		Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.
Males .....	* 488	465	95.3	390	79.9	369	75.6	84	17.2	4	0.8
Females .....	* 507	489	96.4	435	85.8	394	77.7	32	6.6	3	0.16

	Oxyuris.		Amoeba.		Ciliates.		Flagellates.		Encysted protozoa.		Total infections.	
	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.
Males .....	1	0.2	14	2.9	1	0.2	19	3.9	3	0.6	881	180.5
Females .....	3	0.6	13	2.6	1	0.2	24	4.7	6	1.2	909	179.3

\* Five examinations not included; specimens sent to laboratory without giving sex of patient.

The figures in males differ materially in several instances from those obtained from prisoners at Bilibid Prison<sup>2</sup> as follows: Infected with *ascaris* at Bilibid, 26 per cent; with *trichuris*, 59 per cent; with hook-worms, 52 per cent; with *amoeba*, 23 per cent; with ciliates and flagellates, 21 per cent.

TABLE 3.—Age distribution of infections.

Age (years).	Total number examined.	Total infected.		Ascaris.		Trichuris.		Hook-worms.		Strongyloides.	
		Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.	Num-ber.	Per cent.
Under 2 .....	73	46	63.0	39	53.4	22	30.1	0	-----	0	-----
2 to 4 .....	100	96	96.0	87	87.0	75	75.0	1	1.0	2	2.0
5 to 9 .....	127	126	99.2	119	93.7	108	85.0	4	3.2	1	0.8
10 to 14 .....	53	53	100.0	50	94.3	44	83.0	11	20.8	0	-----
15 to 29 .....	227	221	97.4	194	85.5	177	78.0	37	16.3	1	0.4
30 to 49 .....	250	248	99.0	203	81.0	204	81.6	42	17.0	1	0.4
50 and over .....	137	137	100.0	110	80.3	112	81.7	17	12.4	2	1.5
Under 15 .....	* 353	321	90.9	295	83.6	249	70.5	16	4.5	3	0.8
15 and over .....	* 614	606	98.7	507	82.6	493	80.3	96	15.6	4	0.7

\* Thirty-three examinations not included; age of patients not determined.

<sup>2</sup> *This Journal*, Sec. B (1908), 3, No. 3.

TABLE 3.—Age distribution of infections—Continued.

Age (years).	Oxyuris.		Amœba.		Ciliates.		Flagellates.		Encysted protozoa.		Total infections.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Under 2	1	1.4	0		0		3	4.1	0		65	89.0
2 to 4	1	1.0	2	2.0	0		8	8.0	1	1.0	177	177.0
5 to 9	1	0.8	3	2.4	0		7	5.5	1	0.8	244	192.1
10 to 14	0		0		1	1.9	4	7.5	0		110	207.5
15 to 29	1	0.4	9	4.0	0		10	4.4	2	0.9	431	189.9
30 to 49	0		7	2.8	1	0.4	10	4.0	1	0.4	469	187.6
50 and over	0		6	4.4	0		8	5.8	1	0.7	258	188.3
Under 15	3	0.8	5	1.4	1	0.3	22	6.2	2	0.6	596	168.8
15 and over	1	0.2	22	3.6	1	0.2	28	4.6	4	0.7	1,158	188.6

TABLE 4.—Age distribution of infections, males.

Age (years).	Total number examined.	Total infected.		Ascaris.		Trichuris.		Hook-worms.		Strongy-loides.	
		Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Under 2	37	21	56.8	17	45.9	10	27.0	0		0	
2 to 4	53	51	96.2	44	83.0	41	77.4	1	1.9	1	1.9
5 to 9	56	56	100.0	54	98.8	47	83.9	3	5.4	0	
10 to 14	19	19	100.0	19	100.0	15	78.9	5	26.3	0	
15 to 29	120	117	97.5	100	83.3	92	76.7	28	23.3	1	0.8
30 to 49	120	118	98.3	92	76.7	96	80.0	30	25.0	1	0.8
50 and over	71	71	100.0	55	77.5	57	80.0	13	18.4	2	2.8
Under 15	165	147	89.1	134	81.2	113	68.5	9	5.5	1	0.6
15 and over	311	306	98.4	247	79.4	245	78.8	71	22.8	4	1.3

Age (years).	Oxyuris.		Amœba.		Ciliates.		Flagellates.		Encysted protozoa.		Total infections.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Under 2	0		0		0		1	2.7	0		28	75.7
2 to 4	0		1	1.9	0		0		0		88	166.0
5 to 9	0		0		0		4	1.7	0		108	192.8
10 to 14	0		0		1	5.3	0		0		40	210.5
15 to 29	1	0.8	4	3.3	0		4	3.3	2	1.7	232	193.3
30 to 49	0		4	3.3	0		1	3.3	1	0.8	228	190.0
50 and over	0		1	5.6	0		6	8.5	0		137	192.9
Under 15	0		1	0.6	1	0.6	5	3.0			264	160.0
15 and over	1	0.3	12	3.9			14	4.5	3	0.9	597	192.0

TABLE 5.—*Age distribution of infections, females.*

Age (years).	Total number examined.	Total infected.		Ascaris.		Trichuris.		Hook-worms.		Strongyloides.	
		Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Under 2.....	36	25	69.4	22	61.1	12	33.3	0	-----	0	-----
2 to 4.....	47	45	95.7	43	91.5	34	72.3	0	-----	1	2.1
5 to 9.....	71	70	98.6	65	91.5	61	85.9	1	1.4	1	1.4
10 to 14.....	34	34	100.0	31	91.2	29	85.3	6	17.6	0	-----
15 to 29.....	107	104	97.2	94	87.9	85	79.4	9	8.4	0	-----
30 to 49.....	130	130	100.0	111	85.4	108	83.1	12	9.2	0	-----
50 and over.....	66	66	100.0	55	83.3	55	83.3	4	6.1	0	-----
Under 15.....	188	174	92.6	161	85.6	136	71.8	7	3.7	2	1.1
15 and over.....	303	300	99.0	260	85.8	248	81.5	25	8.3	0	-----

Age (years).	Oxyuris.		Amoeba.		Ciliates.		Flagellates.		Encysted protozoa.		Total infections.	
	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.	Num-ber.	Per-cent.
Under 2.....	1	2.8	0	-----	0	-----	2	5.5	0	-----	37	102.8
2 to 4.....	1	2.1	1	2.1	0	-----	0	-----	1	2.1	81	172.3
5 to 9.....	1	1.4	3	4.2	0	-----	3	4.2	1	1.4	136	191.6
10 to 14.....	0	-----	0	-----	0	-----	4	11.8	0	-----	70	205.9
15 to 29.....	0	-----	5	4.7	0	-----	6	5.6	0	-----	199	186.0
30 to 49.....	0	-----	3	2.3	1	0.8	6	4.6	0	-----	241	185.3
50 and over.....	0	-----	1	1.5	0	-----	2	3.0	1	1.5	118	168.6
Under 15.....	3	1.6	4	2.1	0	-----	9	5.3	2	1.1	324	172.3
15 and over.....	0	-----	9	3.0	1	0.3	14	4.6	1	0.3	553	184.2

## INTESTINAL WORMS.

The results of the examinations at Taytay agree with those of the other series in showing the Filipinos almost universally infected with intestinal worms. Of the 4,106 prisoners examined at Bilibid about 84 per cent were infected; of the 385 women and children in Manila, 89 per cent. At Taytay, infections with intestinal worms were found in 96 (95.9) per cent.

The average number of infections with intestinal worms for each 100 persons examined (indicating multiplicity of infection) was 172.6 at Taytay, 138.7 among Manila women and children, and 142 among Bilibid prisoners.

Referring to Table 2, it will be noted that there is practically no difference between the sexes with regard to the percentage infected or to the average number of infections per 100, though the prevalence of certain individual parasites differs materially.

With regard to the prevalence of worms in the various age groups, (Tables 3, 4, 5) little difference is noted in the total proportion infected and the average number of infections, excepting that the figures are lower for those less than 2 years old (nursing children). Still, over 60 per cent of these were infected and they averaged nearly ninety infections to a hundred. Here again the rate of infection with the individual parasites varies considerably in the different groups.

#### ASCARIS INFECTIONS.

82.9 per cent.

Roundworms were the parasites most frequently encountered, and they were much more prevalent in the Taytay population than among either the Bilibid prisoners (26 per cent) or the Manila women and children (53 per cent). They were somewhat more common among females (85.8 per cent) than among males (79.9 per cent), and among children between 2 and 14 years of age than in other ages. Female children between 2 and 14 years gave over 91 per cent of *Ascaris* infections.

Among older age groups *Ascaris* and *Trichuris* are about equally prevalent.

#### TRICHURIS.

In the results at Bilibid and for the women and children in Manila whipworms were the most prevalent of intestinal parasites (59 and 86 per cent respectively.) At Taytay, *Trichuris* was found in 77 per cent of the people, being second in frequency to *Ascaris* alone; and these two worms together gave 1599 of the total 1726 infections with intestinal worms.

The whipworm infections at Taytay were very evenly distributed proportionately in the two sexes and among the various age groups (see Tables 2 to 5), only the children under 2 years of age showing any marked difference from other groups.

#### HOOKWORM INFECTIONS.

Only 116 infections with hookworms were found among the 1,000 persons examined at Taytay, an average of only 11.6 per cent, and this has occasioned considerable surprise. An infection of 60 per cent has been reported from Philippine Scouts, 50 per cent from Bilibid prisoners, and Stiles and Garrison reported 10 per cent in American soldiers two years after they had left the Philippines.

It must be noted that all the figures are based upon the examination of adult males, and when the results at Taytay are considered for different sexes and ages (see Tables 4, 5, 6) the disparity is not so remarkable, though still great.

All males examined at Taytay gave 17.2 per cent infected with

hookworms; females, 6.6 per cent. Adults (over 15 years) gave 15.6 per cent, children 4.5 per cent. The 311 adult males gave 71 infections or 22.8 per cent, and of these 71 cases, 58 were between the ages of 15 and 50 years. In other words, of the 116 hookworms infections, 58 or exactly half were among the 240 males between the ages of 15 and 50, giving a rate of 24.2 per cent.

## IDENTITY OF PARASITES.

Specimens were secured from about one-fifth of the cases and were all of the "new world" hookworm, *Necator americanus*.

## SEVERITY OF INFECTIONS.

Of the 116 infections, there was no one which showed more than from one to five ova to the average cover-glass preparation and the greatest number of worms recovered after treatment in any one case was fourteen.

## CLINICAL MANIFESTATIONS.

In view of the small number of worms present in the cases of infection with hookworms, any severe clinical manifestations would not be expected.

However, in view of the interest taken in hookworm infections in the Philippines the past two or three years, it was thought highly desirable to investigate thoroughly and to demonstrate as clearly as possible the actual medical importance of hookworms in the conditions as found at Taytay.

A Tallquist hæmoglobin test was made of the blood of 712 persons who presented themselves at the clinic. Of this number 20 or 2.8 per cent were recorded with less than 50 per cent of normal hæmoglobin. Most of these were just under 50 per cent. Two hundred and seventy-five of the 712 patients tested for hæmoglobin, or a fraction over 38 per cent, were recorded with between 50 and 80 per cent. Here again by far the greater number approached the higher figure. Four hundred and seventeen, or about 58 per cent, gave a hæmoglobin test of over 80 per cent. These figures indicate roughly that there was severe anæmia present in something less than 3 per cent of the people examined, a mild anæmia in about 38 per cent, and normal hæmoglobin in about 60 per cent.

That the hookworm infections can not be held accountable for the anæmia found at Taytay is apparent from the facts that only 3 of the 20 patients in whom the hæmoglobin registered below 50 per cent and only 21 of the 275 patients in whom it was between 50 and 80 per cent, were infected with hookworms, while 61 of the 356 patients giving roughly a normal hæmoglobin estimate were infected with hookworms. In other words, the percentage of hæmoglobin in the hookworm cases was rather higher on the whole than in the cases not so infected. This is graphically shown in the following table.



*Comparative hæmoglobin tests of hookworm and other cases.*

Percentage of hæmoglobin.	Number of patients not infected with hookworms.		Number of patients infected with hookworms.	
	Number.	Per cent.	Number.	Per cent.
Under 50 -----	17	2.7	3	3.5
50 to 79 -----	254	40.5	21	24.7
80 to 84 -----	176	28.0	21	24.7
85 to 90 -----	150	23.9	27	31.8
Over 90 -----	30	4.8	13	15.3
Under 80 -----	271	43.3	24	28.2
Over 80 -----	356	56.7	61	71.8

Of the three hookworm cases having less than 50 per cent hæmoglobin, one complained of gastric pain and vomiting and gave a history of malaria; the second, was afflicted with nephritis and mitral regurgitation; in the third no cause for the anæmia was found; very few hookworm ova were present and no worms could be found in the stool saved after the first treatment with thymol.

## GENERAL CONSIDERATIONS.

The absence of clinical manifestations, the small number of worms found in the infected cases, and the low percentage of persons infected, indicate that hookworms play a very small part in the sanitary conditions encountered at Taytay.

Practically all medical workers in the Philippines since American occupation are in accord regarding the rarity of the severe forms of hookworm disease and also as to the mildness of the average infection. Nearly all investigators, on the other hand have reported a much higher percentage of the people infected. These investigations, however, have been almost exclusively among adult males in military organizations or in Bilibid Prison, the work at Taytay being the first to be conducted among a normal population living under natural conditions.

The fact that the adult males who do most of the work in the fields gave nearly 25 per cent infected with hookworms while women and children gave only 3.3 and 4.5 per cent, respectively, would indicate that the infections are acquired for the most part out in the fields away from the dwellings and the possibility naturally suggests itself that soldiers, especially in the early days in the Islands, were more exposed to infection in that they were more or less constantly wading streams, tramping through swamps and marshes and camping on wet ground.

The soil at Taytay is a heavy alluvium and, according to some observers, the nature of the soil is an important factor in the incidence of hookworm infections. What part this may play in the Philippines remains to

be investigated, but the rarity of clinical evidence of hookworm disease in sandy as well as in clay districts would seem to make it improbable that any great difference will be found in this respect.

STRONGYLOIDES AND OXYURIS.

0.7 per cent. 0.4 per cent.

The presence of these parasites has been noted frequently by various workers in the Philippines but never in a high percentage of cases. Among the Bilibid prisoners 3 per cent were infected with *Strongyloides* and 0.8 per cent with *Oxyuris*. Manila children gave 2 infections with pinworms among 158, or 1.26 per cent. Strong in 1901 reported 13 cases of *Strongyloides* (0.6 per cent) among 2,179 persons examined in the Philippines.

Adult specimens of pinworms were obtained from two of the Taytay cases and were determined as *Oxyuris vermicularis* (Linnaeus), 1767. No adult *Strongyloides* were secured, only the embryos being found.

INTESTINAL PROTOZOA.

AMÆBA.

2.7 per cent.

In various series of examinations of stools in the Philippines, the percentage of intestinal *amæba* reported has varied from something over 20 per cent to as high as 50 and even 70 per cent. In one hundred autopsies at the Philippine Medical School, Gilman reported typical, active, amœbic ulceration of the large intestine present in 32 cases. In examinations at Bilibid Prison 26 per cent (Musgrave and Clegg) and 23 per cent (Garrison) of the prisoners have been reported to have motile *amæba* in their stools.

At Taytay, the stools of only 27 persons in the thousand examined showed motile *amæba*. Eleven other cases showed encysted bodies which we felt were probably *amæba* but the diagnosis could not be made with certainty.

About one hundred specimens of fæces included in our figures were a day old when brought to us and had these shown amœbic infections proportionately as did the others our total figures would be raised to about 30 infections, or 3 per cent.

It was a matter of no little surprise to those engaged in this work that the number of amœbic infections should fall so far short of what both others and we ourselves had found in previous examinations of Filipinos, but throughout the course of the work and with special care in searching for these infections the figures remained proportionately the same.

No attempt was made to differentiate between *Entamæba coli* and *E. histolytica*.

There was no preponderance of amœbic infections in either sex or in any age group. No infections appeared in children under 2 years old.

#### CLINICAL MANIFESTATIONS.

Of 1,122 patients attending the clinic during the three months it was in progress, 60 had intestinal disorders. Of these 35 were diagnosed as cases of dysentery. Of the 35 cases of dysentery, 12 had *amœbæ* in their stools, leaving 23 cases of dysentery in which *amœbæ* could not be found and 15 patients with *amœbæ* in their stools who showed no symptoms of amœbic enteritis. In other words, a definite diagnosis of amœbic dysentery was made in only 12 (about 1 per cent) of the total 1,122 persons attending the clinic. Of these 12 cases, 5 had flagellates in their stools as well as *amœbæ*.

One other case with dysenteric symptoms had encysted organisms in his stool which were probably *amœbæ*. The remaining cases with encysted organisms had no symptoms of dysentery.

There was one questionable case of liver abscess with no history of previous dysentery. The patient died in April but consent for an autopsy could not be obtained.

To summarize, there were 27 patients of the 1,000 examined, or 2.7 per cent, who showed motile *amœbæ* in their stools. There were 35 cases, or 3 per cent, of 1,122 patients examined which were clinically diagnosed as dysentery. There were 12 patients (13 including the one with encysted forms) with *amœbæ* in their stools and with dysenteric symptoms, or about 1 per cent of those examined. Fifteen had *amœbæ* in their stools without dysenteric symptoms. Twenty-three had dysentery without *amœbæ*.

#### FLAGELLATES AND CILIATES.

5.5 per cent. 0.2 per cent.

The figures for these infections are not considered to be of much statistical value. Both flagellates and ciliates appeared much less frequently than we have been accustomed to find them in other series of examinations in the Philippines. At Bilibid Prison we found 23 per cent of the prisoners to have these organisms in their stools.

Of the two cases with ciliates, the organism in one appeared to be *Balantidium coli*, in the other it more closely resembled the saprophytic *Paramœcium* commonly found in water and may have been a contamination. In both cases the ciliates had disappeared after treatment for *Ascaris*.

The identity of the flagellates was not determined in the majority of the cases. Most of those studied appeared to be *Cercomonas hominis* and it is probable that most of the infections were with this organism.

## APPLICATION OF RESULTS.

It is necessary to know how fairly and how adequately the group of persons examined for any given infection represented the normal population of the town of Taytay before the percentage of infection found can be interpreted for the general community. In other words, it is essential that the presence and amount of any selection among the persons examined, either by sex, age, occupation, condition of health, or otherwise, be carefully determined.

The results of the examination of 1,000 persons, or nearly one-fifth of the population, should be a fairly satisfactory basis provided they fairly represent the community.

The amount of selection present with regard to sex and age is shown in Table 5, wherein is set forth the proportion of the total population of Taytay examined for intestinal parasites in the two sexes and in each age group.

Seventeen per cent of the total population were examined. The amount of selection by age or sex is represented, therefore, by the difference between 17 and the percentage examined in any age or sex group. In the results for all males and all females the figures are 17.0 and 17.2, indicating practically no sex selection. Likewise the total figures for those under 15 years (16.5 per cent) and those of 15 years and over (17.5 per cent) show little difference in the proportion of children and adults examined. Among males alone and among females alone, the difference between the proportion of adults and children examined is still less than 3 per cent and less than 2 per cent, respectively. So far, therefore, it is apparent that there was practically no age or sex selection. As we go up the male and female columns, however, taking the smaller age groups separately we find certain groups represented in considerably higher or lower proportion than the average. Among the males, all the age groups are well within 3 per cent of the average proportion excepting the 10 to 17 years group which, with only 7.8 per cent of the population within those ages examined, falls nearly 10 per cent below its fair representation. Among the females, the various age groups are less evenly represented than among the males, though no group varies so far from the average as the male 10 to 14 year group. The female 10 to 14 year group gives only 13.7 per cent and the 15 to 29 year group only 12 per cent examined. The 30 to 49 year group, on the other hand, shows an excess of over 5 per cent and the 5 to 9 year group an excess of 3.5 per cent. These results for the sexes separately find expression in the total column for each age group in that the 10 to 14 year group falls short of the average representation (17 per cent) by 6.2 per cent and the 30 to 49 year group shows an excess proportion by 4.1 per cent.

TABLE 5.—*Proportion of the population examined for intestinal parasites in each sex and age group.*

Age groups (years).	Males.			Females.			Total.		
	In population.	Examined.	Per cent examined.	In population.	Examined.	Per cent examined.	In population.	Examined.	Per cent examined.
Under 2 .....	198	37	18.7	213	36	16.9	411	73	17.8
2 to 4 .....	312	53	17.0	278	47	16.9	590	100	16.9
5 to 9 .....	300	56	18.7	347	71	20.5	647	127	19.6
10 to 14 .....	245	19	7.8	247	34	13.7	492	53	10.8
15 to 29 .....	735	120	16.3	889	107	12.0	1,624	227	14.0
30 to 49 .....	611	120	19.6	572	130	22.7	1,183	250	21.1
50 and over .....	367	71	19.3	343	66	19.2	710	137	19.3
Under 15 .....	1,055	165	15.6	1,085	188	17.3	2,140	353	16.5
15 and over .....	1,713	311	18.2	1,804	303	16.8	3,517	614	17.5
Total population .....	2,768	476	17.2	2,889	491	17.0	5,657	967	17.0

In order to determine approximately what changes would occur by substituting in our tables hypothetical figures obtained by raising or lowering these disproportionately represented groups so that each group examined represented 17 per cent of that group in the general population, assuming the same rate of infection to be maintained, a hypothetical table was prepared and it was found that the number of persons infected, the number of infections per 100 persons, and the rate of infection with each parasite separately was changed by less than 1 per cent in each case.

With regard to sex and age therefore, there was no selection among the persons examined which materially influences the results obtained.

Division of labor in the community was so incompletely developed that no classification by occupation is of much value. Rice farming and fishing are the industries almost exclusively followed, and though a man might pronounce himself a carpenter, or a musician, as frequently was the case, upon inquiry it would nearly always be found that a certain amount of his time would be spent as a fisherman or in the rice paddies. Neither was it possible to definitely separate fishermen from farmers as many were both. Occupation, therefore, was for the most part a question of age or sex and any material selection by occupation would appear under those heads.

A very large percentage of the persons who attended the clinic came with no complaint or with some indefinite or imaginary one. Many came in company with sick friends. From as many as possible of these healthy persons, as well as from the sick, specimens of feces were examined. In addition, receptacles for specimens of stools were distributed promiscuously through the town either by the town officials or by members of the expedition as the census was taken. In other words, from the



beginning, our endeavor was to make our examinations for parasites upon persons representative of the entire community, and it is believed that with the care taken there could be no material selection of persons on the ground of the condition of health.

We have gone into this matter of selection of cases rather at length for the obvious reason that as such selection is eliminated, the validity of the results obtained is strengthened and the possibilities of their application as an index to infection in the general population are broadened.

We have no hesitation in saying, therefore, that the results obtained by the examination of 1,000 persons in Taytay, as set forth in Table 1, may safely be taken as an index to the amount of infection in the entire community. It is obvious that the percentages based upon a large number of infections are more reliable than those upon a few infections, since the latter would be changed materially by finding but a few additional infections.

The applicability of the amount of infection with the various intestinal parasites found at Taytay to the population in other parts of the Islands can be dealt with only in general terms, and the disparity between the Taytay results and the results of other series of examinations made in Manila indicate the necessity of caution in making a general application of results.

However, Taytay was selected for the work with a view to obtaining a community which would be representative of a large section of the country, namely, the greater part of central and southern Luzon inhabited by the Tagalogs. In much of this section the conditions of soil, and climate, the occupation, and habits of the people are practically identical with those in Taytay and for these parts it is reasonable to suppose that the incidence of infection with the parasites in question would be about the same as that found at Taytay. In other regions, where the country is mountainous, or the soil sandy, or in towns situated on the coast, the amount of probable infection can be predicted much less confidently and we believe that only the actual examination of people living under these different conditions will give as satisfactory information on the subject.

In view of the figures obtained at Taytay, those which resulted from the examinations of soldiers and of prisoners at Bilibid were evidently misleading when taken as an index to the frequency of infection in the general population, in that they indicated an excessively high frequency of infection with hookworms and *amæba* and too low a frequency with *Ascaris*. Knowledge of the real incidence of these infections throughout the Islands must depend upon a continuance of such work as was done at Taytay in various localities representing various existing conditions.



# MEDICAL SURVEY OF THE TOWN OF TAYTAY.

## XI. TABLE OF PHYSICAL EXAMINATIONS.

By FRED B. BOWMAN, LEONCIO LOPEZ, VICENTE E. MANAPAT and VICENTE RIVERA.

The following table gives the results of 789 physical examinations which for the most part were made by Doctor Bowman, of the Biological Laboratory, Bureau of Science, and Doctors Lopez, Manapat and Rivera, recent graduates of the Philippine Medical School, with the assistance of various members of the expedition.

Clinical histories were taken of all cases and the cards containing them have been carefully reviewed. In a number of cases in which a diagnosis had been made tentatively it was changed in the present table to "indefinite," in view of the fact that it was frequently difficult to make an accurate diagnosis of obscure conditions in the short time available for the examination of many of the cases.

Of the 789 examined, 558 complained of some form of disease; the remainder were apparently healthy. The 9 cases of cholera are not included in this table.

Nervous system:		Fevers:	
Neuritis peripheral	12	Malaria	18
Hemiplegia	3	Typhoid	4
Epilepsy	2	Varicella	1
Insanity	1	Measles	1
Facial palsy	1	Whooping cough	1
Indefinite	14	Dengue	2
		Indefinite	33
Genito-urinary system:		Puerperal sepsis	1
Gonorrhoea	1	Special organs:	
Cystitis	2	Otitis media	8
Stricture	1	Mastoiditis	1
Nephritis	4	Disease of teeth	4
Hydrocele	1	Harelip	1
Indefinite	14	Eye disease	14
Males	14	Skin:	
Females	14	Infections and abscess	30
Tumors:		Ulcers	5
Abdomen (1 sarcoma, 2 fibromata)	6	Yaws	21
Leg (sarcoma)	1	Circulatory system:	
Breast (sarcoma)	1	Endocarditis	6
Lip (epithelioma)	1	Indefinite	7
Thyroid (goitre)	11	Anæmia	7
		Hæmorrhoids	7

General diseases:		Alimentary system—Continued.	
Rickets	3	Intestines—	
Rheumatism, indefinite	17	Amœbic dysentery	12
		Dysentery	23
Alimentary system:		Diarrhoea	10
Stomach—		Enteritis	15
Gastritis	7	Hernia	2
Gastralgia	7	Respiratory system:	
Indefinite	52	Tuberculosis	30
Liver—		Pleurisy	2
Cirrhosis	1	Pneumonia	6
Abscess	1	Asthma	3
Gall-bladder disease	2	Bronchitis	47
Indefinite	2	Indefinite	77

## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### XII. EXAMINATIONS OF THE BLOOD WITH SPECIAL REFERENCE TO MALARIA.

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By LUIS GUERRERO and VICTOR SEVILLA.

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Malaria is endemic in the Philippines and is present throughout the whole year, though the number of cases varies at different seasons. During the months of March to June, the amount is small, later in the year it begins to increase in a remarkable manner, and in the months of November, December, January, and February—that is, after the rainy season is over—it becomes much more prevalent. During this last period a large number of cases occur in the infected districts, especially among the country people, and there have been occasions when the harvesting of rice had to be suspended on account of the number of people afflicted with this disease. As the epidemics frequently coincide with the rice harvest, the natives usually ascribe the cause of the disease to the ingestion of green rice, that is, to rice newly mown.

According to the investigations of Craig<sup>1</sup> at Camp Stotsenberg, the recrudescence of malaria coincides with the abundance of *Anopheles*, and undoubtedly such must be also the case with the other infected areas of the Archipelago, for at the end of the rainy season, when the fields become dry, pools and other natural receptacles for water are left, which are used for breeding places by mosquitoes.

The investigations at Taytay upon malaria were conducted during the months of March, April and May, in the midst of the hot season, when the fields were entirely dry and many of the sources of water supply almost exhausted. Only after prolonged search was a breeding place of *Anopheles* found; this was in the neighborhood of a well from which part of the inhabitants obtained their water supply. Among the 1,131 persons who visited the dispensary, only 16 cases were found to be infected with malaria. This number agrees very well with the scarcity of *Anopheles*. As to the type of the parasite, 12 were infected with the tertian

<sup>1</sup> *This Journal* (1906), 1, 523.



and 4 with the æstivo-autumnal parasite, as may be seen from the following table:

Persons infected—	Num- ber.	Variety.			With splen- omegaly.
		Tertian.	Quartan.	Æstivo- autum- nal.	
With fever.....	15	12	-----	3	7
Without fever (latent malaria) ..	1	-----	-----	1	-----
Total .....	16	12	-----	4	7

The most frequent type of infection was that of mild tertian fever. All of the patients but one, at the time of the examination, complained of fever, more or less intense. One case had no febrile symptoms and may be considered as a case of latent infection. No cases of quartan infection were found, and no case of marked malarial cachexia. As to the character of the infection, it may be said that excepting in three patients who had suffered from relapses the attacks were probably all primary.

For the purpose of determining the number of latent cases of malaria in the town, an investigation of the blood of all cases of splenomegaly encountered was also made. It has been suggested by a number of observers that the amount of malaria in a locality may be roughly judged by observing the percentage of cases of splenomegaly among the people; that is, that the enlargement of the spleen is an index of the amount of malaria present.

Among 1,131 people, we found only 13, or 1.14 per cent, with an enlarged spleen. However, it must also be taken into account that there are in the Philippines cases of splenomegaly due to other causes than malaria.

The blood of all those who had an enlarged spleen and came to the clinic for physical examination was subjected to a special investigation, and in only 7 of them was the parasite of malaria encountered; the remainder always gave negative results although repeated examinations of the blood were made. The blood of 742 persons was examined for malarial parasites, and as has been stated, in only 16, or 2.16 per cent, was the presence of the parasite demonstrated.

Special attention was also devoted to the examination of the blood of children, who, according to the researches of Koch, Stephens, Christophers, and Sargent in Africa, James in India, and Craig in the Philippines, seem to suffer more than adults from latent infection. The blood of 278 children was examined, of whom only 5, or 1.8 per cent, were found infected. The following table will show the relation existing between malarial infection and the age of the children, as found in Taytay and at Camp Stotsenberg by Craig.

*Relation of malarial infection and age of children at Taytay and Camp Stotsenberg.*

## TAYTAY.

Age.	Number.	Number infected.	Per cent.	Variety.		
				Tertian.	Quartan.	Æstivo-autumnal.
1 to 5 years.....	129	2	1.5	2	-----	-----
5 to 10 years.....	95	2	2.1	2	-----	-----
10 to 15 years.....	54	1	1.8	1	-----	-----
Total.....	278	5	-----	5	-----	-----

## CAMP STOTSBERG (CRAIG).

1 to 5 years.....	40	30	75.5	10	4	16
5 to 10 years.....	54	20	37.0	8	1	10
10 to 15 years.....	53	13	24.5	5	1	7
Total.....	147	63	-----	23	6	33

The number of children examined by us was much larger than that studied by Craig, though the number of infected cases observed by us was very much lower than that which he found. By comparing the two preceding tables no decrease in our figures in the percentage of infection can be noticed proportionate to the increase in age of the individuals such as has been observed by other investigators. This may be explained perhaps by the very small number of infections found among the number of children examined.

All the cases of malaria discovered in Taytay seemed to be isolated sporadic cases. All the other members of the families of two individuals found infected with malaria and of six with splenomegaly, were completely free from malaria as is shown by the following table:

Family.	Number of its members.	Number of infections.	Number of splenomegalies.	Variety.		
				Tertian.	Quartan.	Æstivo-autumnal.
1	3	-----	1	-----	-----	-----
2	3	-----	1	-----	-----	-----
3	2	-----	1	-----	-----	-----
4	3	-----	1	-----	-----	-----
5	3	-----	1	-----	-----	-----
6	3	-----	1	-----	-----	-----
7	4	1	1	1	-----	-----
8	2	1	1	1	-----	-----

It is true that the cases with splenomegaly showed at the time of examination only a slight enlargement of the spleen. The blood from these cases was examined on two different occasions with negative results.

It is not strange that this small town, situated in the Mariquina Valley and near the shores of Lake Bay, in a decidedly marshy region, should be so sparsely infected with malaria, for the disease is rather a local one and is apt to appear in various local foci within a certain limited area. There are many towns in the Philippines similar to Taytay which, though exhibiting the same topography, show, nevertheless, a higher degree of infection.

In view of the conditions of the soil and the meagre number of infections found during the period when we made the investigations, we conclude that an antimalaria campaign here would be carried out more successfully during the dry season (February, March, and April) when the number of cases of malaria and the number of breeding places of mosquitoes are at a minimum.

As to the method which would seem to be most advisable for the extermination of malaria here, we believe that the systematic administration of quinine to all cases found carrying the malarial parasite and the destruction of the larvæ of *Anopheles* by the sprinkling of kerosene oil in all water holders and receptacles, are the principal measures which may be used with success. The natives are well acquainted with the efficiency of quinine in combating malaria, and even those most ignorant and prejudiced against any but native medicines are willing to take quinine without serious objection.

The free distribution of quinine by the Government or the regulation of the sale of the drug so as to render it cheaper, are other measures which might also be adopted for the benefit of the people.

#### OTHER STUDIES OF THE BLOOD.

Systematic analyses of the blood of the majority of the people who called at the dispensary, were also made with the idea of discovering what parasitic diseases of the blood were prevalent in the locality as well as with the idea of throwing light upon other diseases and aiding in establishing an accurate diagnosis.

The specimens were collected from persons of both sexes and of all ages, some of whom were actually sick, though the majority did not show any indication of illness.

The percentage of hæmoglobin was first determined. The Tallquist method was employed on account of its simplicity and because it was considered sufficiently accurate for clinical purposes. The lowest average of hæmoglobin registered was 15 per cent and the highest 95 per cent. In the majority of the cases the hæmoglobin oscillated between 70 and 85 per cent with a total average percentage among 616 persons who were

examined of 56.4 per cent. Only two persons showed such low averages as 15 and 20 per cent; the first one was in a child 2 years old, suffering from a heavy infection of *Ascaris*; and the second in a girl of 19 years, suffering with chlorosis.

Among the 11 cases of malaria an average of 75.9 per cent of hæmoglobin was found, the lowest registering 60 per cent and the highest 90. Among 572 persons in whom the percentage of hæmoglobin fluctuated between 60 and 90 per cent, we found an average of 56.4 per cent. The relatively high percentage of hæmoglobin found among the malaria cases was probably due to the fact that the majority of them were primary infections in whom oligochromemia was not marked.

To our great regret counts of the red blood corpuscles and of the leucocytes, owing to lack of time, were performed only in very few cases. In our opinion the number of red blood corpuscles in the majority of the Filipinos of Taytay is undoubtedly below the number considered normal for the inhabitants of temperate climates.

Fresh blood smears from 742 individuals were examined, but no other parasite was found in these specimens, excepting the parasite of malaria which was encountered in 16 cases.

The spirochæta of relapsing fever was sought for in the blood of all the fever patients who came to our dispensary and in many others who were confined to their homes, but was not found.

A differential count of the leucocytes was made in 129 persons, as shown in the following table.

[Figures indicate percentages.]

	Lympho- cytes.	Large mononu- clears.	Polymor- phonu- clears neu- trophiles.	Eosino- philes.	Mast cells.
Leucocytes obtained at Taytay -----	34.5	4.1	51.6	11.2	0.16
Leucocytes in normal blood after Ca- bot and Da Costa:					
Cabot -----	20-30	4-8	62-70	0.5-4	0.025-0.50
Da Costa -----	20-30	4-8	60-75	0.5-5	0.025-0.50

From this table it may be seen that if we adopt as a standard the figures given by Cabot and Da Costa, a small increase will be noticed among the number of the lymphocytes and a decrease in the polymorphonuclear cells, while the large mononuclears and the mastcells remained normal. The percentage of eosinophiles is also increased in the majority of cases above normal, and in some cases it rose as high as 36.6 per cent; this marked eosinophilia is ascribable to the fact that 94 per cent of the population are affected with intestinal parasites and a large percentage suffer from various skin diseases.

Wickline,<sup>2</sup> in the investigations made by him at Camp McGrath, Philippine Islands, for the purpose of determining the effects of the tropical climate on the white race, also arrived at very similar results. In three examinations conducted by him at intervals of six months in 104 American men, he found a diminution of hæmoglobin, an increase of the red blood corpuscles, a steady decrease in the polymorphonuclear cells and a relative augmentation of the lymphocytes, and especially of the eosinophiles.

In the differential counting of the leucocytes we followed the technique recommended by Rogers, counting backward and forward across the slide, and eliminating the borders and edges of the blood smear. The results were obtained from a count of 250 leucocytes in each instance.

As to the classification of the leucocytes we also followed the method adopted by Da Costa and by Rogers.

<sup>2</sup> The Military Surgeon (1908), 23, No. 4, 282.



## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### XIII. FILARIASIS, MALARIA, TUBERCULOSIS, TYPHOID FEVER, GOITRE, BERIBERI, VENEREAL AND SKIN DISEASES.

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By HENRY J. NICHOLS.<sup>1</sup>

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*Microfilaria bancrofti* was searched for in the blood taken at night of 400 persons and was found in one case. This was in a man 28 years old who was born in Taytay and had always lived there except for two years spent recently in towns on the lake within a radius of 20 miles of Taytay. He had no signs of elephantoid disease. The embryos had a nocturnal periodicity but there were very few present even at midnight. The blood of the man's father contained no embryos; his wife and mother declined to be examined. A number of examinations of other people residing in the neighborhood were made, but were also negative. *Culex fatigans* Wied. was found by Banks in only one locality on the opposite side of the town.

Of the 400 persons examined about one-half were adult males, about one-quarter adult females and about one-quarter children and old people. The specimens were secured by going to *tiendas* in each part of the town between 8 and 10 p. m. with a lantern and depending on the natural curiosity of the natives, a few coppers and the diplomacy of the medical students to attract a small crowd. Usually there was little difficulty in obtaining the consent of the individual to allow the specimen of blood to be taken after several of the inhabitants were shown the parasite.

A woman 33 years old, suffering with elephantiasis (Plate No. XV, fig. 1) came to the clinic from Napindan, a town four miles distant, where she was born and had always lived. Ten years ago her left leg began to swell, this symptom being accompanied with fever. Eight years ago the swelling ruptured near the ankle, discharged blood and a white fluid, and then healed, leaving the markedly depressed scars seen in the picture. No microfilariæ were found in the serum from the leg or in the blood collected at night.

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According to Phalen and Nichols, who studied the distribution of filariasis among the Philippine scouts, 0.5 per cent of Tagalogs outside of Manila are affected. The finding during the present survey of one case in a little over 200 adult males confirms the former figure for this group, but the percentage would be considerably less if the whole population were considered. Evidently filariasis with its consequences, although it is to be found here, if sought for, plays but an insignificant part in the health of the people and does not call for active prophylactic measures. The only question of interest is, why in the presence of occasional cases and the filaria-bearing mosquito, the disease is so rare here and so prevalent elsewhere on the same island. It is to be noted in this connection however, that *Culex fatigans* Wied. is present only in small numbers.

*Malaria*.—An examination of the blood of about 600 dispensary patients revealed the presence of malarial parasites in 19 cases or in 3 per cent. The spleen was examined in 233 children at the dispensary, and in 5, or 2.1 per cent, was found to be enlarged. Among 556 adults, enlargement of the spleen occurred eight times, or in 1.4 per cent. About 5 per cent of all the persons infected with malaria exhibited no symptoms of illness. The disease affected chiefly the adult males and children, very few cases being seen in adult females. Most of the cases gave a history of repeated disability from attacks of fever.

The tertian parasite was found in 14 cases, the æstivo-autumnal in 4, and the quartan in 1. The enlargement of the spleen in all the cases was slight except in one case, a boy of 14 years infected with the quartan parasite, where it was marked.

The most interesting feature is the distribution of the cases of malaria along the banks of the streams shown in the map (Plate IV), in which Mr. Banks found *Myzomyia rossii* breeding. No cases of malaria were found more than two or three blocks away from these streams. In one house, father and son were found with enlarged spleens. The other cases were found isolated and examinations of the blood made of the rest of the family were negative.

Although Taytay is not a highly malarious town, something of a prophylactic nature could be done, in view of the distribution of the cases, by cleaning the banks of the esteros and by draining the stagnant pools.

*Tuberculosis*.—A special study of tuberculosis was made according to which it was estimated that there were about 60 cases of this disease in the town, or that 1 per cent of the population were affected; 35 of the cases were adult males over 20 years of age (2 per cent); about 15 of the cases were females (1 per cent); and 10 were children (3 per cent). About 800 persons were examined physically and 114 sputum examinations made. In 20 cases tubercle bacilli were found; 3 children had

joint lesions and 7 adults had unmistakable clinical signs of tuberculosis without showing tubercle bacilli in the sputum. A great many of the people complained of some trouble with the lungs, and 51 of these, considered possibly tubercular, were examined a month or two later, 11 or about one-fifth were then found to be affected, 5 showed tubercle bacilli in the sputum and 6 definite clinical signs of the disease. The rest had either asthma or heart disease or had entirely recovered from what had evidently been attacks of bronchitis.

No focus of tuberculosis was found. The disease was distributed evenly over the town. (Plate No. V.) No special family infection could be observed. Very few patients had been sick over two years and it would appear that they generally do not live much longer than two or three years after having been infected. The death rate is about 4 per thousand, or 25 per year.

Pulmonary tuberculosis was most frequently observed; one case of spinal tuberculosis, 2 cases of tuberculosis of the skin and 3 cases of joint involvement were encountered. The larynx was involved in 3 cases. In young adults the disease ran a relatively rapid course.

It is our belief that something could be done here in combating tuberculosis by segregation of the patients in a sanitarium and by the disinfection of their sputum. The chief need of those affected is nourishing food.

*Typhoid fever.*—Four cases of typhoid fever were seen among the natives of Taytay and one in a resident of Manila who was taken sick five days after arrival in Taytay. The location of these cases is shown in the map. (Plate V.) Two of the cases were typical from a clinical standpoint, the fever continuing for four weeks. One of these, a male aged 24 years, gave a Widal reaction on the 19th day of the disease and a positive one on the 36th day. The other case, a girl of 14 years, gave a positive Widal on the 16th day; typhoid bacilli, a blue strain, was recovered in plate cultures from her fæces. The other two cases were in girls, aged 6 and 7 years respectively, who had fever of ten and fourteen days, and in which the blood showed a Widal reaction after the subsidence of the fever. None of the patients had been out of Taytay for one month before becoming sick. No connection between the cases could be traced. The wife of the first case gave a Widal reaction and an indefinite history of fever, but no bacilli were found in her fæces. The blood from the members of the family in which the cases occurred and of people who had been in contact with the sick ones was examined by the Widal reaction but none gave a positive reaction.

Some of the early reports of the Surgeon General's Office and of the Bureau of Health give the impression that typhoid fever is a comparatively rare disease in the Philippines and that those cases which are found have been imported. The same idea was formerly held in India but recently it has been shown by Rogers and others to be erroneous and does

not appear to hold good for the Philippines. Typhoid fever has been found to be endemic in Samar, Leyte and Iloilo, where it was especially frequent among children. If the disease had been recently introduced here into an entirely nonimmune population, its severity and mortality ought to be much greater than it is.

It would seem that the blue variety of the typhoid bacillus is the common one in the Philippines, whereas the ordinary or "lilac" variety is the common one in the United States.

*Goitre*.—Eleven cases of goitre were found; as a special search was made for this disease, and since it is so easy of detection, it is safe to say that practically all the cases in the town were observed. All were in women. The average age at the time of onset of the goitre was 28 years; the average duration at present is 15 years, and the average age of the individual affected, 43 years. The onset in each case was after the age of 20. As the number of females over 20 in the town is about 1,500, the proportion of females affected is about 7 per cent. The largest goitre is shown in Plate No. XVI, fig. 2; it is cystic and of over thirty years' duration. The others varied in size and location, some being just perceptible, one case had marked exophthalmos and deviation, with palpitation, extreme nervousness and a history of variation in the size of the tumor. (Plate XVI, fig. 1.) Two other cases had milder exophthalmos and some palpitation.

It will be seen from the geologist's report that Taytay is on a non-Cretaceous soil so that these cases can not be associated with the ingestion of an excess of lime salts.

*Beriberi*.—No definite case of beriberi was seen, with œdema, loss of knee jerk, pain in the calf muscles, weakness and heart disturbance. On the other hand several cases were found with symptoms resembling those of beriberi. They were all women, after childbirth, who complained of numbness and tingling of the legs and arms and exhibited diminished or lost knee jerk. One case presented a general weakness of the muscles and palpitation. These cases exhibited a mild peripheral neuritis but whether this was due to pressure, anæmia, or to some specific disease, such as beriberi, it was difficult to say.

The small amount of beriberi found in Taytay is in marked contrast to the amount seen among bodies of laboring men such as railroad gangs, Philippine Scouts and Constabulary, all of whom suffered considerably. The evidence, as far as it goes, is in accord with the polished rice theory of the cause of beriberi, as the natives use but little milled rice, while soldiers and laborers are given Saigon or polished rice.

*Venereal disease*.—Venereal disease is decidedly rare in the town. One case of acute urethritis, 1 case of stricture of the urethra, 2 cases of cystitis, and 1 case of ophthalmia neonatorum all of gonorrhœal origin

were observed. Evidences of syphilis were also rare. One case with loss of palate and septum, possibly syphilitic, 1 case of gumata of the frontal bone, 2 cases of hemiplegia with a suggestive history of previous lesions of syphilis, 1 case of parenchymatous keratitis and 3 cases of Hutchinson's teeth in small children were seen.

Our experience at Taytay and elsewhere does not support the conventional statement that the natives of the Philippines are "riddled with venereal disease." This statement may be partly true in the larger cities and among the camp followers of the white troops; but among the rural population which makes up the bulk of the Filipinos, prostitution is not a recognized institution and venereal disease can not be considered as a noteworthy feature from the standpoint of health. Among the native soldiers venereal disease is very rare.

*Skin diseases.*—Five hundred individuals were thoroughly examined for skin diseases and 192, or 38.4 per cent, were found to be affected with some disturbance of the skin. Since but very few persons complaining of skin diseases alone, came to the clinic, this percentage may be taken as fairly representative of the general population. For convenience, those examined were divided into three groups—children (under 15 years), adult males, and adult females (15 years and over). These groups were affected as follows:

TABLE I.

	Number exam- ined.	Number affected.	Per cent affected.
Children .....	180	71	39.4
Adult males .....	125	55	44
Adult females .....	195	66	33.8
Total .....	500	122	38.4

The commonest skin diseases are tabulated as follows:

TABLE II.

	Children.		Males.		Females.		Total.	
	Cases.	Per cent.	Cases.	Per cent.	Cases.	Per cent.	Cases.	Per cent.
Tinea versicolor .....	8	4.4	20	16	18	9.2	46	9.2
Tinea circinata .....	2	1.1	9	7.2	4	2	15	3
Scabies .....	20	11.1	11	8.8	13	6.6	44	8.8
Impetigo conta- giosa .....	33	18.3	1	.8	4	2	38	7.6
Total .....	63	34.9	41	32.8	39	19.8	143	28.6



The following table gives the number of less common and special skin diseases.

TABLE III.

	Males.	Fe- males.	Chil- dren.	Total.
Acne .....	2	3		5
Blastomycosis .....	1		1	2
Adventitious burse .....	2			2
Bunion .....		3		3
Callosity .....	1	2	1	4
Epithelioma of lip .....		1		1
Furunculosis .....	2	1	1	4
Fibromata .....	3	7		10
Keloid .....	2			2
Leprosy .....	1			1
Measles .....			1	1
Miliaria .....	1			1
Pompholyx .....		1		1
Pigmentation .....		3		3
Seborrhoea .....	1	1		2
Tuberculosis cutis .....	1		1	2
Urticaria .....		1		1
Verrucosity .....	3	2		5
Vitiligo .....	2	1		3
Yaws .....	4	1	16	21

*Tinea versicolor* infections made up about one-fourth of the skin diseases observed. The affection (see Plate XVII, fig. 2) is noteworthy only on account of its slight disfigurement. In this connection it should be stated that in one-half of the cases the lesions were situated on the face and were thus exposed to light in contradistinction to the usual location in temperate climates. The frequent occurrence of the lesion on the face of natives of the tropics has been noted in Assam by Powell and others. The disease is especially noticeable in the young of both sexes (16 per cent of males and 9 per cent of females being affected). In many cases the lesions were extensive. The best antiseptic treatment seems to be sulphurous acid generated directly upon the skin by applying first a 10 per cent solution of sodium hyposulphite and then a second solution of 5 per cent tartaric acid.

*Tinea circinata* was less prevalent in Taytay than in Manila. The region around the groin is seldom attacked probably on account of the loose clothes worn. Most of the cases seen in Taytay showed only small patches on the wrists and waist.

*Scabies* (Plate XVII, fig. 1) was found to be very common, affecting 8 per cent of the population. However, no special attention is paid to it by the natives. They know the organism which causes the infection and frequently extract it on a needle for the sake of curiosity. Nothing particular was noticed about the disease except that it seemed to be the starting point for impetigo contagiosa in children and sometimes it was difficult to separate the lesions in a mixed case.

*Impetigo contagiosa* was very common among young children and gave many of them a repulsive appearance by producing crusts over the head and face and often over the entire body. *Staphylococcus pyogenes aureus* in pure culture was isolated from 3 cases. Several cases of infected glands were found at the base of infected scalps. The lesions or scars of this disease, together with those of

smallpox and yaws are so common that it was difficult to find a child with an entirely normal smooth skin.

The following diseases were looked for but were not found: *Tinea imbricata*, *Tinea nigra* (Castellani), *Pinta*, and *Tinea tonsurans*. Two cases which clinically resembled blastomycetic infection were seen but sections of the skin could not be obtained.

*Puente*.—In examining the adults, especially the women, one frequently meets with circular scars about one inch in diameter, on the arms, legs and thighs which might be mistaken for vaccination marks. These scars result from the healing of running sores called by the natives "Puente" (corruption of the Spanish word *fuentes*=spring) which have been produced for the purpose of causing counterirritation. The method of their production is as follows: In a small area of inflammation, which has been set up by the application of lime to the skin, an abrasion is made, and upon this a small piece of betel-nut or wax is bound. Plate XVIII fig. 2, shows the binder in place and fig. 1 shows a resulting ulcer with a piece of wax in place. *Puente* is produced as a counterirritant to any sort of pain or altered sensation and is most frequently used on the legs during pregnancy. Only one case was seen in a man, he having a pad covering an ulcer on his abdomen.

*Fibromata*.—Symmetrical fibromata were seen a number of times in persons over 30, most frequently in females. The distribution of these fibromata is shown in Plate XIX. Two were excised and on section found to be fibroma dura; several felt partly calcified. The tumors spring, apparently, from the subcutaneous tissue and are not painful nor adherent to any particular structure. About one in every thirty women over 30 years of age was found to have them either on one or on both ankles and elbows.

*Yaws*.—This disease is known in Taytay as "*galis pateros*," *galis* being the Tagalog name for scabies, and *pateros* (Spanish name for duck farm) the name of a town near by where yaws is supposed to be particularly prevalent and is thought to be contracted from a scaly lesion on the head of the ducks. Twenty-one cases were found after a special search and it is believed that nearly all the cases in the town were seen. (Plate XX.) Sixteen cases were found in children under 10 years of age, and, as the number of such children in the town is about 1,650, hence about 1 per cent were infected. *Treponema pertenue* was found in three cases examined with the use of Giemsa's stain but the clinical appearance is so characteristic that further microscopical examination was considered unnecessary. The circinate, tubercular, ulcerative, and desquamative forms occurred, but no lesions of yaws were seen on the soles of the feet.

In almost every case the disease was attributed to contact with some other case and in all but one, in spite of very common glandular enlargement the yaws seemed to develop gradually by autoinoculation from

previous lesions. One case showed an extensive eruption of yaws of similar size. In order to get the good will of the patients, silver nitrate was applied to the lesions but was considered only a palliative measure and potassium iodide was given if the patient, as was frequently the case, showed any interest in becoming permanently cured. The lesions, if left alone, seemed to run a chronic course.

The distribution of the cases is seen in the map. (Plate VI.) They usually occurred in groups. Near the station were three adjoining households infected as follows: *First house*, child aged 3; grandfather aged 70; child aged 8 had yaws one year ago; *second house*, child aged 2; *third house*, child aged 2; mother aged 25.

In another part of the town there were four cases in one house, two children, the father and grandfather, and one case across the street. In each neighborhood a history of previous cases could be obtained.

While yaws is principally a disease of childhood, 5 of the cases were in adults; one mother had an ulcerative yaw on one breast near the nipple from nursing a child whose lips were completely covered with lesions; 3 male grandparents had yaws on the side of the neck and head from carrying children, and one father had a general eruption.

Evidently both treatment and some sort of isolation is advisable to eliminate this disease. An infected child of a school-teacher was made to use separate dishes and care was taken to isolate and disinfect its clothing; no further cases occurred in the family.

## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### XIV. THE DISPOSAL OF HUMAN EXCRETA.

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By PHILIP E. GARRISON.<sup>1</sup>

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The importance of this subject in the Philippine Islands has been emphasized recently by resolutions passed at the Philippine Islands Medical Association and by the Manila Medical Society, recommending the appointment of a commission to study this problem and stating that other measures to prevent cholera, etc., must necessarily fail if some adequate provisions be not made for the disposal of excreta. While the party at Taytay was in no sense a commission to investigate this question, advantage was taken of the opportunities to look into the subject. During the taking of the census, an examination was made of each house and premises to see what provisions were made by the inmates for the disposal of excreta. The results of this inspection are given in Doctor Clements' paper, Part IX, The general sanitary conditions of the town. In brief, it may be said that by over 50 per cent of the inhabitants there is no conscious disposal of feces; around one-half of the houses in the town there were no provisions for such disposal and the excreta were deposited on the surface of the ground almost anywhere in the neighborhood and left exposed to the rain, or the sun, or to pigs and chickens to dispose of. In the vicinity of the remainder of the houses there was some kind of outhouse or place devoted to the reception of excreta, but aside from an entrance made in one place for the pigs, no provision had been made for the disposal of the feces. Only 8 per cent of the houses had pits in connection with them. Some of these were sufficiently satisfactory. These were large, fairly deep pits, provided with a floor, an inclosure and a roof; either earth, ashes or rice husks were provided to cover the depositions.

Such being the actual situation what can be done to improve it? A water carriage sewer system is, of course, wholly out of the question, on account of the expense. The earth system is also not feasible, partly

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on account of the expense but chiefly on account of the lack of supervision that would exist were it put in operation. The privy or pit system, which has served in civilized countries so long, seems to be practicable under present conditions. Its success would depend, first, upon proper construction and, second, upon proper supervision.

The pit should be dug 1 meter square and 2 meters deep; if possible, it should be walled with bamboo, the earth from the pit should be banked around the edges and the pit should have a bamboo cover, fitting as tightly as possible; there should be a roof over the pit and a screen on the sides. Earth, ashes or rice husks should be used to cover the faeces. When the pit is three-quarters full, another should be dug near by and the structure moved over it, the old pit being filled in. Frequent inspections, one at least every month, should be made by the municipal physician and the police to insure the success of these pits and, occasionally, disinfectants should be added, particularly when flies are excessive.

Several objections have been made to the pit system: First, that the pits fill up in the rainy season; second, that they pollute the soil and wells; third, that they increase the flies; fourth, that they are not as advantageous for the disposal of excreta as are the natural agents such as the sun and animals.

In answer to the first objection, it may be said that several pits like those described above were made at Taytay and were inspected by the writer at the end of the first quarter of the rainy season. No water was found in the pits dug in the earth and arranged as described above. If there is no roof or covering, some water will collect undoubtedly.

As to the second objection, pollution of the soil and wells does occur with the present arrangements in Taytay; and the pollution of the soil would be less with a pit system while pollution of the wells would probably not be much greater than at present. However, the people usually get their drinking water away from their habitations and will probably have an artesian water supply shortly.

As to the increase of flies: Unless the faeces are covered, flies will undoubtedly breed in them. However, flies abound under the present conditions in Taytay.

Further information on the fly question and the employment of pigs for the disposal of faeces are necessary, but I am satisfied that the pit system is feasible and would be an improvement on the present conditions in Taytay. The pit system can not be used in rocky or swampy soil. A dike system may be feasible under such conditions, but this also would require further investigation.



## MEDICAL SURVEY OF THE TOWN OF TAYTAY.

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### XV. SUMMARY AND CONCLUSIONS.

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By RICHARD P. STRONG.

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In considering these reports one should bear in mind the original purpose of the expedition, which was to obtain exact and comprehensive knowledge of conditions as they actually existed in a typical Filipino town. The primary idea of the survey was not to develop any special line of research, although it was hoped that new conditions might be discovered. The difficulties in carrying out the investigations were not as great in some respects as had been anticipated; the people throughout the town took considerable interest in the work, and there was comparatively little difficulty encountered in obtaining their consent to submit to a physical examination or to one of their blood, or in securing specimens of sputum, faeces or urine when such were desired.

From a consideration of the data at hand, it is believed that a satisfactory knowledge has been gained of the diseases prevalent in the community of Taytay and of the conditions under which the people live there.

As might have been expected, the inhabitants, in building their homes in the lowlands, considered chiefly the conveniences of location in pursuing the agricultural and fishing industries, thus sacrificing the advantages of a healthy location on the hill-lands at the east of the town. (Plate XI, fig. 1.)

The town of Taytay, because of its proximity to the cities of Manila, Pasig and Cainta, where Spanish, Chinese and Indians are present in great numbers, probably contains a more mixed population than the average Filipino village situated along the littoral highlands. It is near Lake Bay and as it also lies at the foot of hills and mountains, therefore, both the fisherfolk and the hill people are found in the town.

From the examination of about 500 men, women and children among the visitors at the dispensary who were carefully measured, the physical types and the ear types associated with them which have been previously described by Doctor Bean, were established and the diseases common to

some of the types were mentioned. From these studies no absolute conclusions would be justified, but the inference is strong that the blend of European and Filipino which most resembles the Iberian, or Mediterranean race of Sergi, is more susceptible to all diseases—and more especially to tuberculosis—than the primitive type. This may indicate that the European-Filipino type, or its resulting offspring, the Filipino-Iberian type, is less resistant to disease in the tropics than is the aboriginal type on its own soil and in its natural environment. In a number of children and adults a dorsal flattening in the brachycephalic region was observed, which was accompanied by projection in the parietal region, prominence in the region of the bregma and bulging in the temporal region. This condition it is believed has been brought about in young children owing to the custom of placing them on hard bamboo floors with only a *petáte*, or thin mat, between the head and the floor when they sleep. A soft pillow, being hot and oppressive for the children, is not used in the Philippines. The child usually lies flat on its back and during sleep or while resting, the head is either straight or turned to one side. After a few months a flat place is frequently formed on that part of the head resting on the floor, and the child then continues to lie on this flat place until the head becomes misshapen and badly deformed. For this reason Doctor Bean believes that the dorsal flattening may occur in many adults and thus the cephalic index is not the best differential factor in racial anatomy. The ear form has been established beyond doubt as a differential factor in racial anatomy, and among Filipinos of the littoral regions it should be placed above the cephalic index in importance, because of the apparent distortion of the head in many individuals. By the ear alone the derivation of the majority of the people may be determined.

The principal occupations of the people are agriculture and fishing. At present their life is not modified to any degree by contact with foreign influence. A slight gain in the population of the town has apparently taken place since 1903, at which time the census showed a population of 5,840 whereas the present census shows one of 6,094.

The water supply is largely from wells which are generally exposed to surface contamination and to contamination from the hands and feet of those drawing water. (Plate XII, fig. 2.) A bacteriological examination of the water from these wells, thirteen in number, showed in six of them, over 5,000 microorganisms per cubic centimeter. *Bacillus coli communis* was isolated from seven, and *Bacillus pyocyaneus* from three. Hence the majority have been contaminated by sewage. The chemical examination of these waters showed that in the majority the amount of chlorine and of albuminoid ammonia and nitrites was so high as to also condemn them from a chemical sanitary standpoint. *Amæba* were found in all but one and *flagellata* in all. However, since the general water supply of Manila usually contains *amæba*, the discovery of these protozoa

in the water of the wells of Taytay might have been expected. The natives of the town, of course, drink the water unboiled. From the character of the drinking-water supply in the town and its constant exposure to surface contamination and to contamination from the hands and feet of those drawing the water, it is evident that the population, under the present conditions, must be exposed from time to time to epidemics of cholera and of dysentery.

It is particularly surprising that more cases of dysentery were not observed during the time that the expedition carried on its work. Only 23 of the 789 individuals examined (2.9 per cent) were suffering from any form of dysentery and but 12 with amoebic dysentery. In view of the fact that practically all the drinking water in Taytay was found to be infected with *amaba*, we must conclude that either most of the species of *amaba* found in the water of the wells are not pathogenic for man or that the great majority of the inhabitants of Taytay are relatively immune to the effects of these *amaba* present in the water. Only one case of abscess of the liver was observed in the town. Although epidemic bacillary dysentery has occurred in several parts of the Islands during the present year, and has been more frequent than at any other time since 1901, no cases were observed in Taytay. However, epidemics of this form of the disease in the Philippines rarely occur before the beginning of the rainy season in June, and are most usual in July, August and September. The remaining eleven cases of dysentery found in the town were of the catarrhal form and were perhaps caused by intestinal infection with *Bacillus pyocyaneus* since this organism was isolated from the water of three of the wells in the town.

Of the protozoal forms of dysentery now recognized, amoebic, malarial and balantidial dysentery are all found and are endemic in the Philippine Islands. However, *Kala-azar* dysentery does not exist here. Of the remaining forms of dysentery (the verminous ones), that one caused by *Schistosoma japonicum* has alone been observed here. *Schistosoma hematobinum* has only been found in Manila in cases in which the infection originated in foreign countries, and *Esophagostomum brumpti* has not yet been discovered in the Philippines. With the exception of the amoebic and catarrhal dysenteries, none of these forms were encountered in Taytay.

The cholera spirillum which was sought for carefully was not found in the water from any of the wells, although several species of vibrios were isolated from some of them. Had one of the wells been infected with the cholera spirillum, there would almost certainly have been an epidemic of this disease in the town, whereas during the three months but nine cases of cholera occurred. The stools of 80 individuals who had been in contact with these cholera cases were examined for the cholera spirillum, but in no case was this organism found. The result was somewhat different from that obtained in Manila and in the vicinity where this disease

had been endemic for some time; in these latter places the stools of 376 apparently healthy people who had come in contact with cholera cases were examined bacteriologically, and the cholera vibrio found in 27 (7.02 per cent). After the disappearance of cholera from Manila, a large number of stools from various individuals were examined over an extended period of time but no typical cholera vibrios were isolated from any of them. The stools of 264 apparently healthy individuals in Bilibid Prison in Manila were also examined for the cholera vibrio during the epidemic, and this organism isolated from 17 (6.44 per cent). It seems probable that the appearance of cholera in Bilibid Prison from time to time, may sometimes be due to these cholera spirillum carriers. It is interesting to note in this connection that all nine of the cases of cholera in Taytay occurred within a period of ten days and during the middle of the hot and dry season. Perhaps for this latter reason the faeces from these cases were rapidly dried by the sun and the cholera spirilla therein thus killed and not disseminated, hence no widespread epidemic occurred and no cholera "spirillum carriers" were discovered. Had these cases of cholera occurred during the rainy season, judging from our past experience, and owing to the conditions of surface drainage in this town, at least a small epidemic of cholera would probably have resulted.

Only four cases of typhoid fever occurred during the three months that the examinations were carried on. There can be no serious ground for the idea that typhoid fever is a comparatively rare disease in the Philippines and that those cases which are found in the Islands have been imported. In the year 1900, I reported to the Surgeon-General of the United States Army fifty-four autopsies upon cases of typhoid fever occurring in Manila. During the same year there were 328 positive Widal serum reactions for typhoid fever observed in the laboratory. Typhoid fever is not nearly so prevalent in Manila and the vicinity as it was during 1900, but since that year the disease has not been at all uncommon, and there is no question but that it is endemic in the Islands and that the large majority of the cases are certainly not imported.

In regard to the improvement of the drinking water supply of Taytay, it is fortunate that the geological strata is favorable to drilling; Doctor Adams has reported it is possible that in the southwestern part of the town sufficient hydrostatic head might be encountered to produce an artesian flow. It is recommended that a deep well be drilled at this place with the hope of obtaining artesian water. In case artesian water is not obtained, the remaining wells which might be drilled in the town should be made only sufficiently deep to prevent surface filtration.

The food of the inhabitants of Taytay was found to be of limited variety and almost entirely of local production; some dried fish is imported from Manila. The staple diet consists largely of fish and rice with some fruits and vegetables, and occasionally carabao milk, butter and eggs.

From a physiological standpoint, the diet of the average person represented 90 grams of protein and 2,700 calories, and for a laboring man 100 grams of protein and 3,100 calories. Practically all of the rice used in the town belonged to the class of cured rice, which it is claimed by the adherents of the rice theory in regard to the etiology of beriberi, never causes this disease even when it forms the greater portion of the nutriment consumed over a long period of time. It is interesting to note in this connection that no case of acute beriberi was discovered in the town. Whatever little evidence there is, therefore, supports the theory that beriberi is caused by the ingestion of uncured rice. It must be admitted, however, that this evidence is probably not of sufficient importance to be used as an argument in favor of this view. Beriberi might be prevalent in a town or district during one season of the year and entirely absent during another.

The cost of the food consumed by the inhabitants usually amounted to between 9 and 16 centavos daily, with an average of  $12\frac{1}{2}$  centavos per person. However, it is not believed that the daily ration consumed by these people is the most desirable one for them or that the most beneficial food can be purchased by them for this amount. Experience in the Philippines has shown that whenever a large number of Filipino men are required to perform under American direction the duties of laborers, in the construction of roads, streets, railroads, etc., a more liberal diet becomes necessary for them. In Bilibid Prison where the prisoners are required to perform a much greater amount of manual labor than the men at Taytay carry on, the cost of the food for each individual averages 21 centavos per day. When, however, a number of these prisoners were transferred outside of the prison and placed upon even harder work, consisting of the construction of fortifications, it was found advisable to increase the amount and cost of the daily ration to 30 centavos per day. Twelve centavos is a sufficient amount to purchase the ration for the average individual in Taytay only because he performs there very little work. When the average Filipino undertakes to carry on the work expected of a laborer he requires a more liberal diet, and one which includes meat in addition to fish. Under such circumstances his physical condition usually becomes greatly improved.

In relation to the entomological study of the town, two new species of mosquitoes were met with, both belonging to the genus *Culex*. A description of these will appear in another number of the General Science section of this JOURNAL.<sup>1</sup> Mosquitoes of the subfamily *anophelinæ* (*Myzomyia rossii* Giles) were found breeding, particularly in the districts of the town along the banks of streams and in all bodies of stagnant water around the wells; they were most numerous along the stream running through the town. It is interesting to note that the distribution of the *anophelinæ*,

<sup>1</sup> *This Journal* (1909), Sec. A, 4, No. 6.



as found by the entomologist, corresponded very well with the districts in which the cases of malaria were discovered by the clinicians. It is not surprising that only about 2 or 3 per cent<sup>2</sup> of those examined in Taytay were found to be harboring the malarial parasite, since the investigations were carried on in the midst of the dry season, which is the time of year in which malaria in Taytay is at a minimum. While the *anopheline*, were moderately abundant, they were not nearly so numerous as they were found to be in Olongapo and Cervantes, both very malarial districts. As far as the conditions for the propagation of malaria are concerned, Taytay is not very unfavorably situated. Mosquito nets were used practically not at all in the town, only about one-half dozen having been seen by members of the expedition.

*Culex fatigans* Wied. was also found breeding in the town. It is interesting to note in this connection that 0.5 per cent of the inhabitants harbored filaria. No evidence was found of the existence of any case of severe infection and this is evidently one reason why filariasis is not more prevalent in the town. The cases of filariasis with numerous embryos in the circulating blood are undoubtedly more dangerous to a community than are those in which but few embryos are present.

It has been suggested by several authors that the amount of malaria present in a community can be estimated roughly by determining the number of cases of enlarged spleen that are encountered. However, in many districts in the Philippines this method would yield very inaccurate results in estimating the amount of malaria present. Chronic enlargement of the spleen is a very common affection among natives of the Philippine Islands. In a large percentage the enlargement is certainly not of malarial origin. In these, aspiration or examination at autopsy reveals no malarial pigment and no malarial parasites. A series of these cases are receiving careful study and a report from this laboratory will soon be made upon them. As is well known, in certain parts of India also enlargement of the spleen is not an index of the amount of malaria present in the locality, since in *Kala-azar* this condition is almost invariably present. It is interesting to note that only in two instances was *Cimex lectularius* L. (the common bedbug) found in Taytay, and that *Cimex rotundatus* Sig., which, according to the researches of Patton, is supposed to convey to man the parasite of *Kala-azar*, was not encountered at all.

Enlargement of the spleen was found in 2.1 per cent of the children examined and in about 1.4 per cent of the adults. No case of *Kala-azar* was found. Indeed, up to the present time this disease is not known to exist in the Philippine Islands.

<sup>2</sup> According to the series of examinations reported by Nichols parasites were found in 3 per cent of the people examined; in the series examined by Guerrero and Sevilla 2.16 per cent were found infected. Latent malaria was found to exist in 5 per cent of the cases by Nichols.

No species of the genus *Glossina* (comprising the tsetse flies) has yet been found in the Philippine Islands. In this connection, it may be mentioned that during the year 1908, a report became circulated in Manila that a case of human sleeping sickness, with trypanosoma infection, had been discovered in the Islands. . . The report gained credence, probably chiefly owing to the fact that the following title of a paper, "Human Trypanosomiasis in the Philippine Islands. First Reported Case," was printed in the programme of the annual meeting of the Philippine Islands Medical Association held in February, 1908. The paper, however, was not read at this meeting and has not since been published; but the statement was made later in a Government report from the Philippines that one case of sleeping sickness had been detected through the year and news had been received of another suspected case in the Province of Albay.

The evidence in regard to this matter is as follows: Mr. Willyoung, of this Laboratory, was sent on a trip to some of the southern islands to perform microscopical examinations of a number of lepers. Specimens of the blood of these cases, some 60 or 70, were taken, and, upon the return of Mr. Willyoung to Manila, these were stained in the Laboratory by an assistant. Upon examination of these specimens microscopically, Mr. Willyoung found in one of them several trypanosomata. He therefore made a second visit to the locality where the specimens had been collected and visited the people from which these specimens were supposedly taken. However, he was unable to locate the particular patient from whom he thought the specimen might have been taken. The question then arose, was the specimen one of human blood, or was it one from a horse infected with surra, or one from some laboratory animal infected experimentally, which the assistant accidentally mixed with the other specimens.

The writer was absent from the Philippines at the time this slide with the trypanosomata was encountered, but upon his return he was shown the specimen in question. As the preparation was already hardened, and stained and mounted in balsam, there seemed little chance of being able to differentiate the nature of the blood by means of the precipitin or complement deflection test. Measurements of the red corpuscles showed the average diameter to be very slightly under that of human red corpuscles. However, by means of these measurements, it was obviously not possible to determine definitely that the specimen was not one of human blood though from the character of the leucocytes it was evidently not horse blood. It is also impossible to differentiate certainly the human trypanosoma from the trypanosoma of surra by microscopical examination alone.

The report of this case, therefore, must remain in doubt. Up to the present time no definite case of sleeping sickness has apparently been discovered in the Philippines.

*Infections with animal parasites.*—An examination of the fæces of

1,000 persons in the town showed that 95 per cent of the people were infected with some form of intestinal worm. The results of these examinations are in accord with those which have been carried out by Doctor Garrison and his assistants in the city of Manila, which have showed that the Filipinos are almost universally infected with these parasites.

No evidence was found of infection with cestodes or trematodes in Taytay. In Manila cases of cestode infection are not uncommon, *Tenia* having been found in 0.7 per cent of the cases examined in Bilibid Prison and in 0.66 per cent in children. The fact that the diet of the people of Taytay so seldom contains any meat evidently accounts largely for the absence of *Tenia saginata* and *Tenia solium* infection among them.

With respect to trematodes it may be mentioned that few cases of paragonimus infection have been found in the Philippines in which the infection was probably acquired as far north as Manila. The majority of the cases have been discovered in the southern provinces or in the Islands south of Luzon. This affection is endemic in portions of Samar. Infections with *Schistosomum japonicum* and *Opisthorcis sinensis* also appear more common in the southern islands than in Luzon. From reports that have reached Manila it seems not improbable that infection with *Filaria medinensis* (the guinea worm) occurs among the Moros in some of the southern islands of the Archipelago. No authentic case, however, has yet been reported from the Philippines.

An attempt to discover any localization in groups of the cases infected with *Ascaris*, hookworms, *Trichuris*, *Strongyloides*, *Oxyuris* or *Amoeba* in any part of the town of Taytay, in proximity to certain wells or streams, by families or occupations, gave negative results.

It was perhaps surprising that only 2.7 per cent of the persons examined were found to be harboring *amoeba*, since in Bilibid Prison, where the water supply of the prisoners is carefully sterilized, 23 per cent of the prisoners had been found to have *amoeba* in their stools. However, it is needless to emphasize that the examinations at Taytay were performed with very great care. It was thought that encysted forms of *amoeba* were discovered in eleven individuals, but no reliance can be placed upon observations relating to the presence of encysted forms of *amoeba* in the stools. Only in cultures of *amoeba* and certainly not in the faeces, can one be certain of recognizing encysted forms. The 27 cases discovered with *amoeba* were evenly divided between the two sexes, and showed no excessive frequency of infection in any single age group.

Only 11.6 per cent of those examined were found to harbor hookworms, and none of them presented any symptoms of disease which could be attributed definitely to this parasite. Eighty-two and nine-tenths per cent were found to harbor *Ascaris*, and about 77 per cent *Trichuris*. It is interesting in this respect to compare the studies of a similar nature carried on in individuals in Manila by Doctor Garrison and his assistants. In the neighborhood of 3,000 examinations were made in Bilibid

Prison and here 84 per cent of the natives were found to be infected with animal parasites—59 per cent with *Trichuris*, 26 per cent with *Ascaris*, and 52 per cent with hookworms. Of 385 women and children examined in Manila, 89 per cent were found infected with *Trichuris*, 53 per cent with *Ascaris* and but 13 per cent with hookworms.

The question has arisen as to what really is the rôle that these infections play in regard to the public health. In my opinion, reasoning from the examinations that have been made, too much stress has been laid on the action which the intestinal worms exert in Luzon in relation to the health of the people. There is probably no evidence which shows that moderate infections with whipworms and roundworms exercise a deleterious effect on the health of the individual. The cases of hookworm infection which we have observed in these Islands have been as a rule mild ones, and this parasite is not as important a factor in Luzon in the production of disease as it is in Porto Rico, Egypt, Japan and several other countries in which the individuals infected frequently exhibit a grave anæmia. In the early days of American occupation of the Islands, when our American troops were frequently encamped in the field near swampy districts, severe cases of uncinariasis with advanced anæmia were occasionally, though rarely, observed among them. Such cases are now almost unheard of among our troops. In Taytay, and in by far the great majority of the cases of infection found in Luzon, the individuals infected exhibited no visible anæmia or other symptoms of disease. Indeed, in the Taytay examinations, while in none of the cases infected with hookworms did the hæmoglobin register 100 per cent, nevertheless in the hookworm cases the hæmoglobin estimations were somewhat higher on the whole, than those in individuals which showed no infection with hookworms. No case in Taytay gave a reading above 95 per cent. It may be stated in general that in the natives of Taytay the hæmoglobin, as determined by the Tallquist test, registered over 80 per cent in only about 60 per cent of the inhabitants. The natives therefore generally show a reduction in the amount of hæmoglobin, below that amount usually observed in healthy individuals in temperate climates.

About 1 per cent of the inhabitants were found to be infected with tuberculosis; no focus of this disease was discovered, the cases being distributed evenly throughout the town. Pulmonary tuberculosis was the common form. No case of relapsing fever was discovered; indeed, no authentic report of infection with the recurrent spirochætæ has yet been made in the Philippine Islands. About 1 per cent of the inhabitants were found to be suffering from goitre. It is interesting to note the very small amount of venereal disease which was observed in the town. On the other hand, yaws was found to be fairly prevalent, 1 per cent of the children being infected. An interesting custom among the natives is the artificial production of sores and ulcers for the purpose of producing



counterirritation on the skin, known by the natives as *punte*; the scars which later result, are apt to puzzle the uninitiated in regard to their origin. These ulcers are sometimes mistaken for syphilitic lesions. Their method of production by the application of lime and later by binding on a piece of betel-nut is described in detail by Doctor Nichols in Part XIII, page 285, and is illustrated in Plate XVIII.

From this brief summary of the studies performed at Taytay, it may be seen that while the conditions in this town are generally unsanitary, the death rate varying in different years from 27.91 per 1,000 to 45.42 per 1,000, they at times may become most unsanitary. Under the present conditions, epidemic diseases such as cholera, typhoid and bacillary dysentery are likely to occur from time to time. The history of the town shows this to be the case in regard to cholera. The great epidemic of 1882 is said to have gained a foothold first in Taytay. In 1902, and again in 1905, cholera was also epidemic there. If the introduction of cholera at Taytay during the present year had taken place in the rainy season instead of in the midst of the dry one, another epidemic of this disease would likely have occurred.

In regard to smallpox, general vaccination against this malady was carried out in 1905 and in March 1909. It is interesting to note in this connection that smallpox was present in 1908 and 1 per cent of the inhabitants died with it. The entire mortality of the year was 45.42 per 1,000. In 1907, when there was no smallpox, the death rate was 27.91 per 1,000. Practically all of the deaths from smallpox were among children under 9 years of age; indeed, nearly 90 per cent were among children under 5 years of age; that is, the majority of the children who died from the disease were born after the general vaccination performed in 1905. Therefore, there should be no difficulty in controlling smallpox by means of vaccination.

There can be no question of the advisability of protecting the inhabitants of Taytay against cholera and perhaps against typhoid fever, also by vaccination. All the evidence that we have from the provinces relative to cholera has shown the practicability and the efficiency of vaccination against this disease as a method of protection. The most striking experience was that obtained in the town of Angat, where one-sixth of the population—that is, all those who volunteered, 1,078 in number—were vaccinated against cholera; a few months later, cholera appeared in the village, 122 persons were stricken with the disease, 121 of whom were among the noninoculated. The vaccination against cholera performed throughout the Islands during the past few years have shown that proportionately six times as many cases of cholera have occurred among those unvaccinated as in those vaccinated. Work in the Philippines in vaccination against smallpox has been very active recently; and it is difficult to understand why so little attention has been paid



here recently to vaccination against cholera and typhoid fever, particularly since vaccination against typhoid fever is being employed in our Army in the United States. Vaccinations for obtaining immunity in the treatment of furunculosis and gonorrhea are at present much in vogue in Manila; but in these instances we have not been able yet to demonstrate that any immunity is obtained by this procedure. In the case of cholera, however, the question has been demonstrated not only by experiment but from a practical standpoint. It is believed that if a large epidemic were imminent the sanitary authorities would not hesitate to employ vaccination against cholera. It would seem, however, that in the case of towns with sanitary conditions similar to those which exist in Taytay, general vaccination against cholera should be performed in order to protect the inhabitants from a general epidemic of this disease which otherwise might occur were the disease introduced at a favorable season. It is true that the sanitary conditions in Taytay can be improved greatly if artesian water can be supplied to the people, but so long as they pursue their present habits in regard to sanitation—particularly those of eating with their fingers from a common dish, drinking water from a jar which is constantly soiled by the hands, and bathing, washing and even drinking from the same stream; and so long as fæces are exposed to flies and other insects in the vicinity of the dwelling houses—so long will they be liable to epidemics of cholera.

In conclusion, it would appear that the sanitary measures to be particularly recommended in Taytay at the present time are supplying the town with an artesian water supply, vaccination against cholera and perhaps against typhoid fever, and an improvement in the present method of disposing of the fæces so that the human excrement is not exposed to flies and other insects and not allowed to lie in close proximity to wells or to houses where food is partaken of. During certain periods of the year something might be done in the way of distributing quinine among those suffering from fever. More extensive prophylaxis against malaria in Taytay is not recommended at the present time.



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### TEXT FIGURE.

General geologic relations of Taytay.



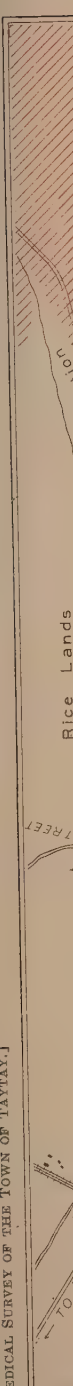
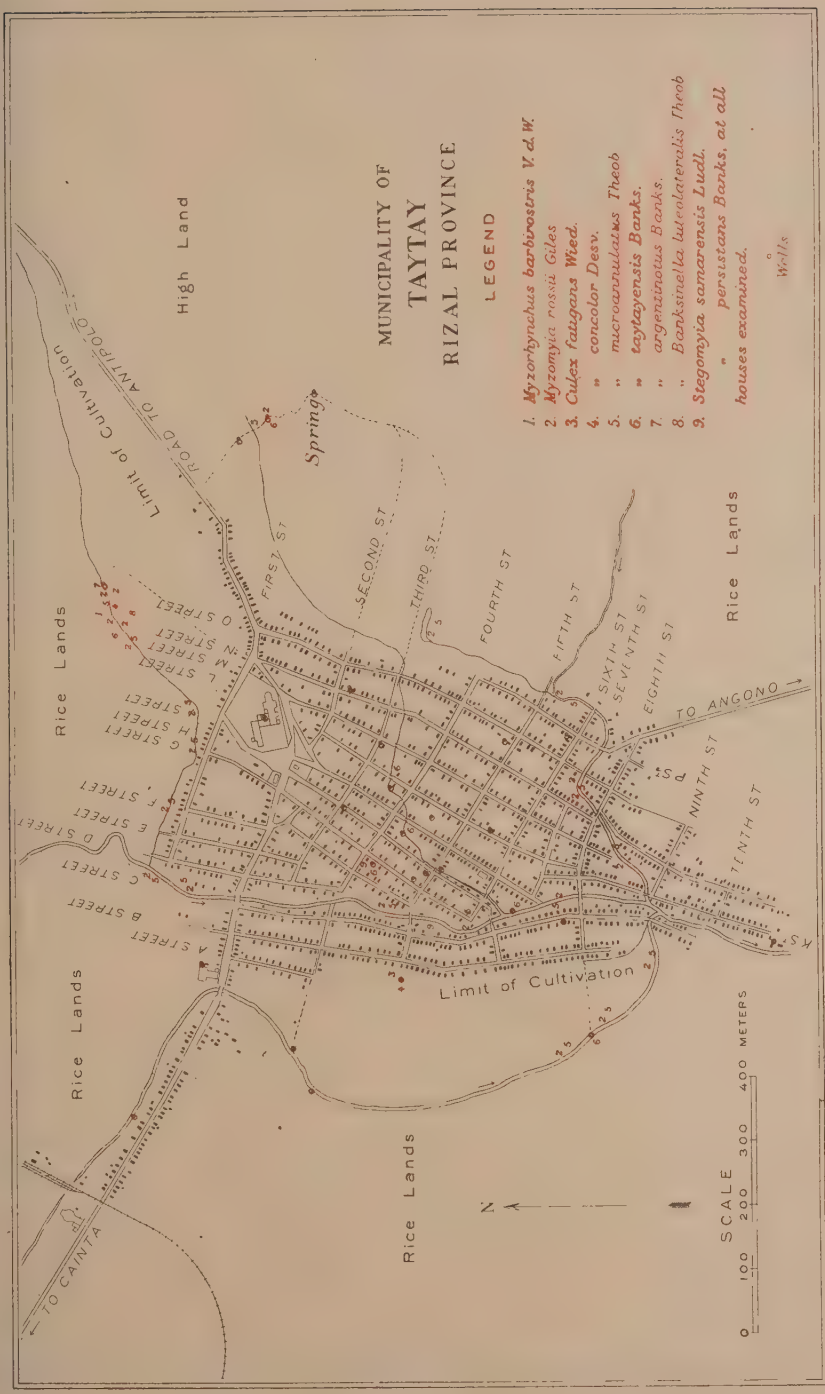


PLATE I.

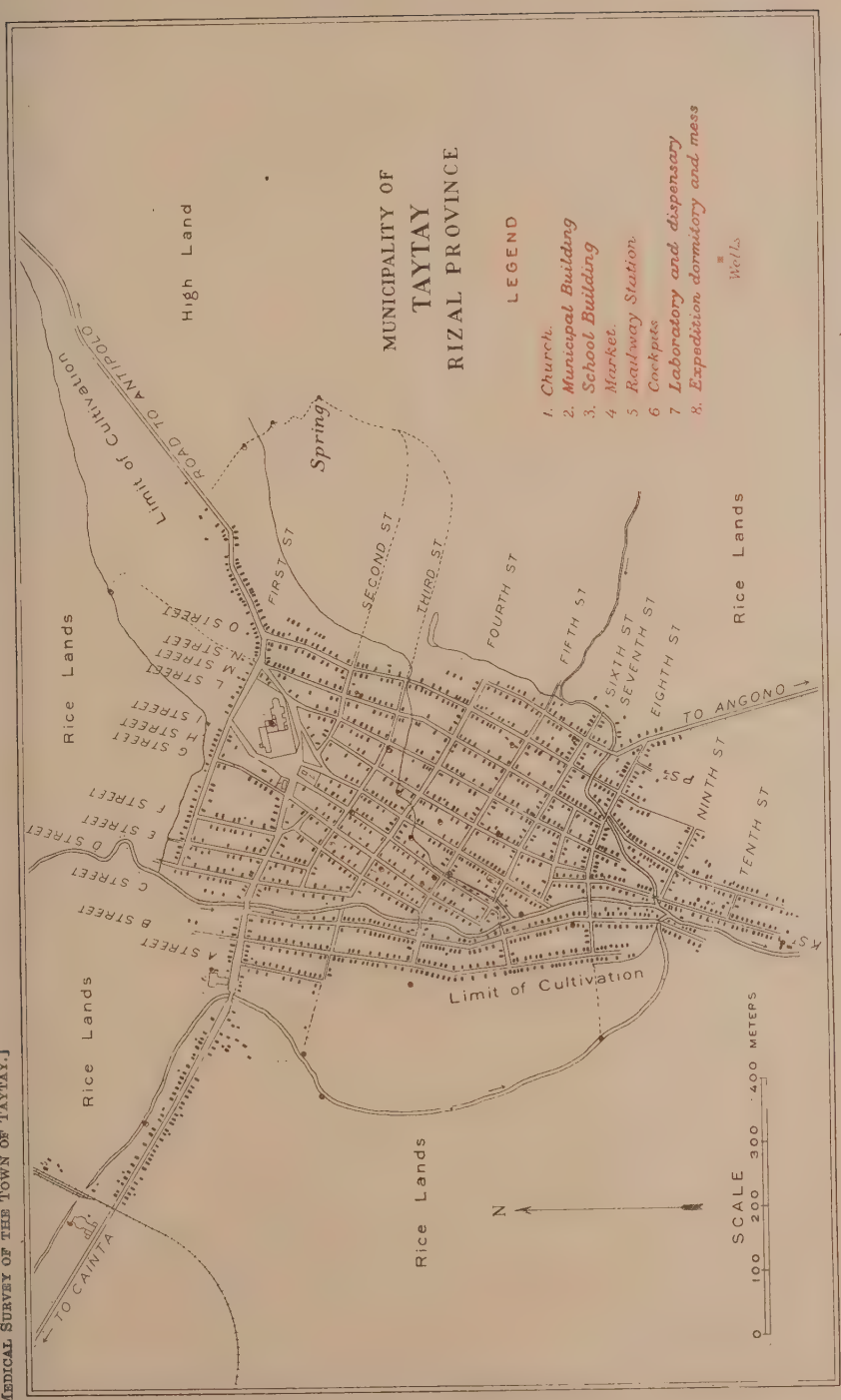






TYPE AND DISTRIBUTION OF MOSQUITOES OF TAYTAY. (BANKS.)

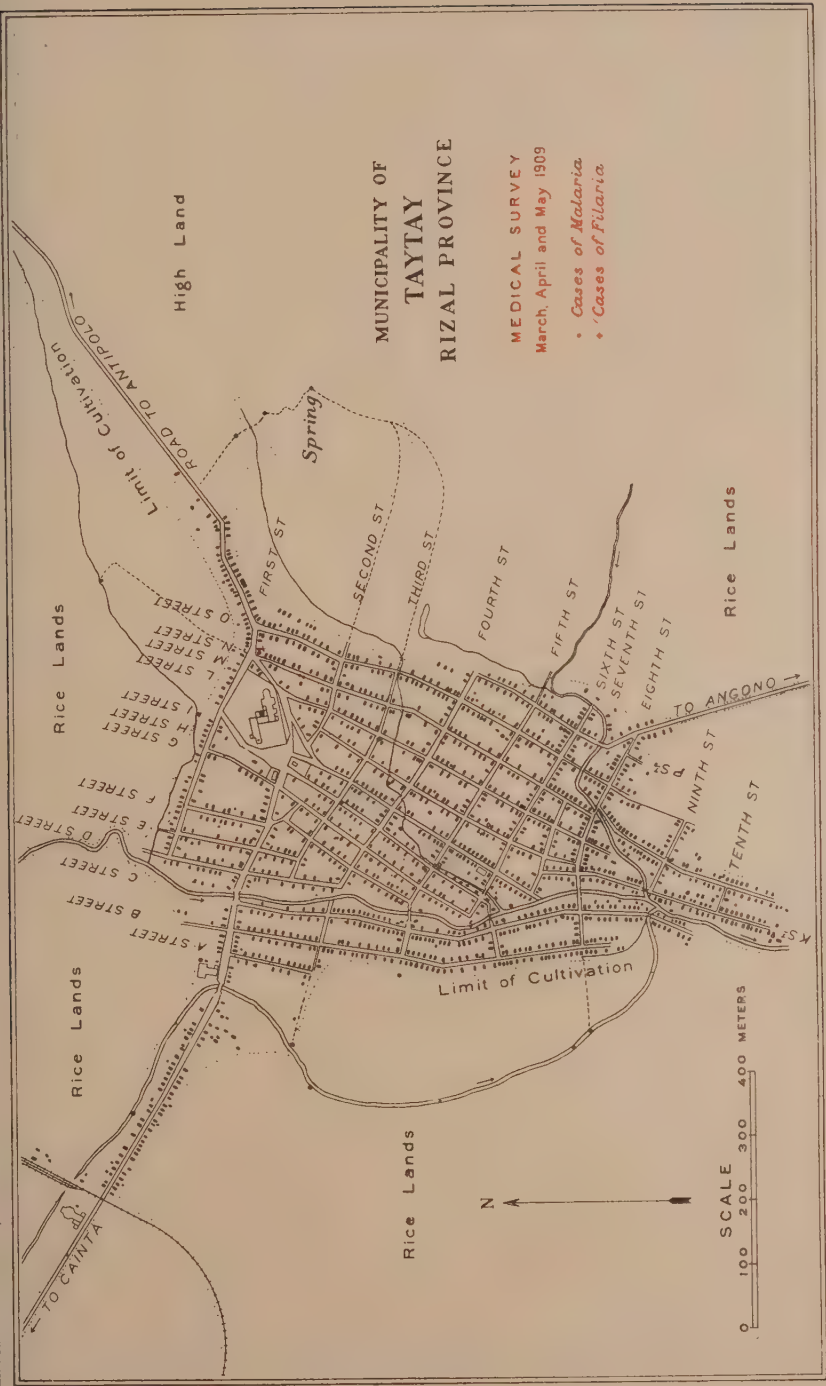




REFERENCE MAP OF TAYTAY SHOWING LOCATIONS OF PRINCIPAL BUILDINGS. (CLEMENTS.)

PLATE III.



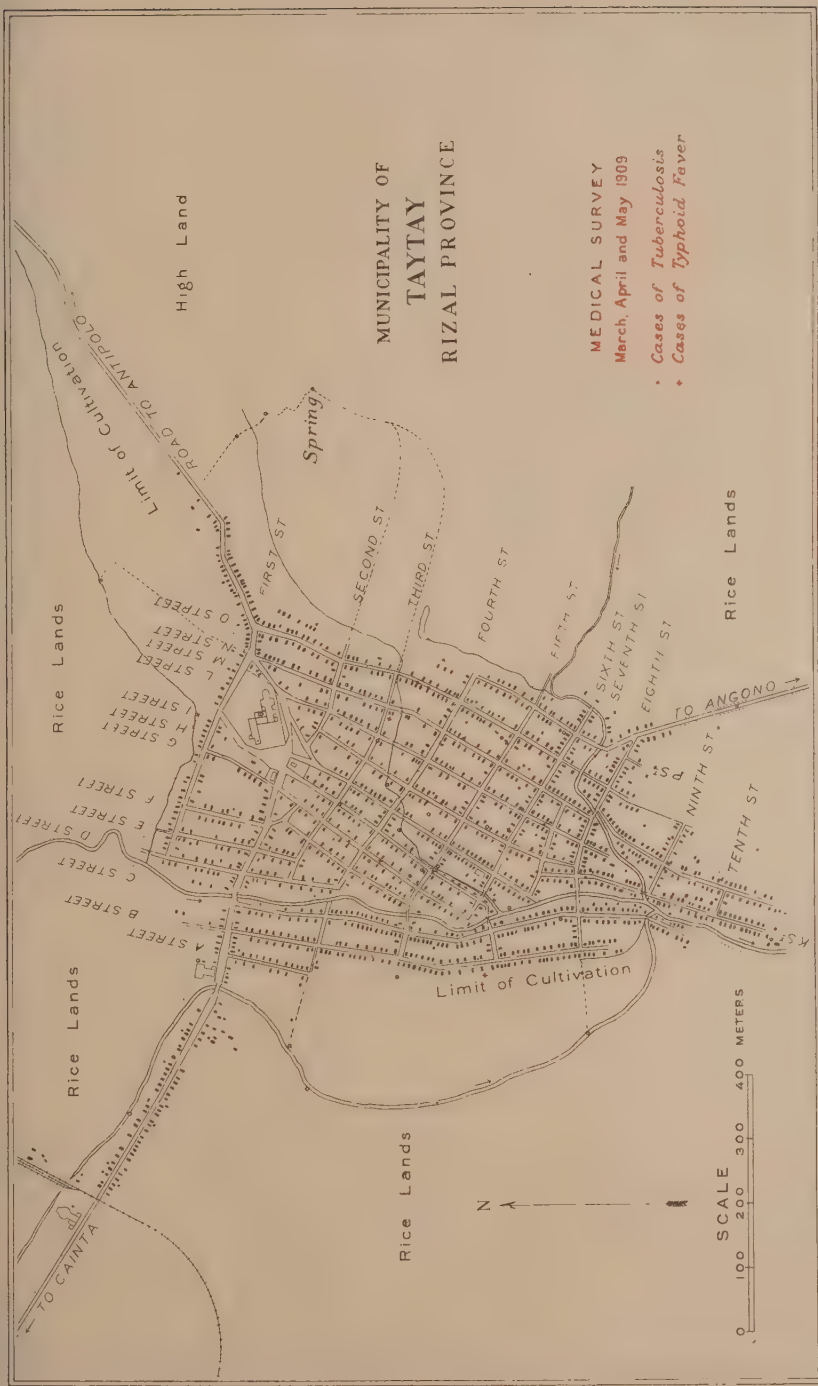


CASES OF MALARIAL AND FILARIAL INFECTION IN TAYTAY. (NICHOLS.)

PLATE IV.

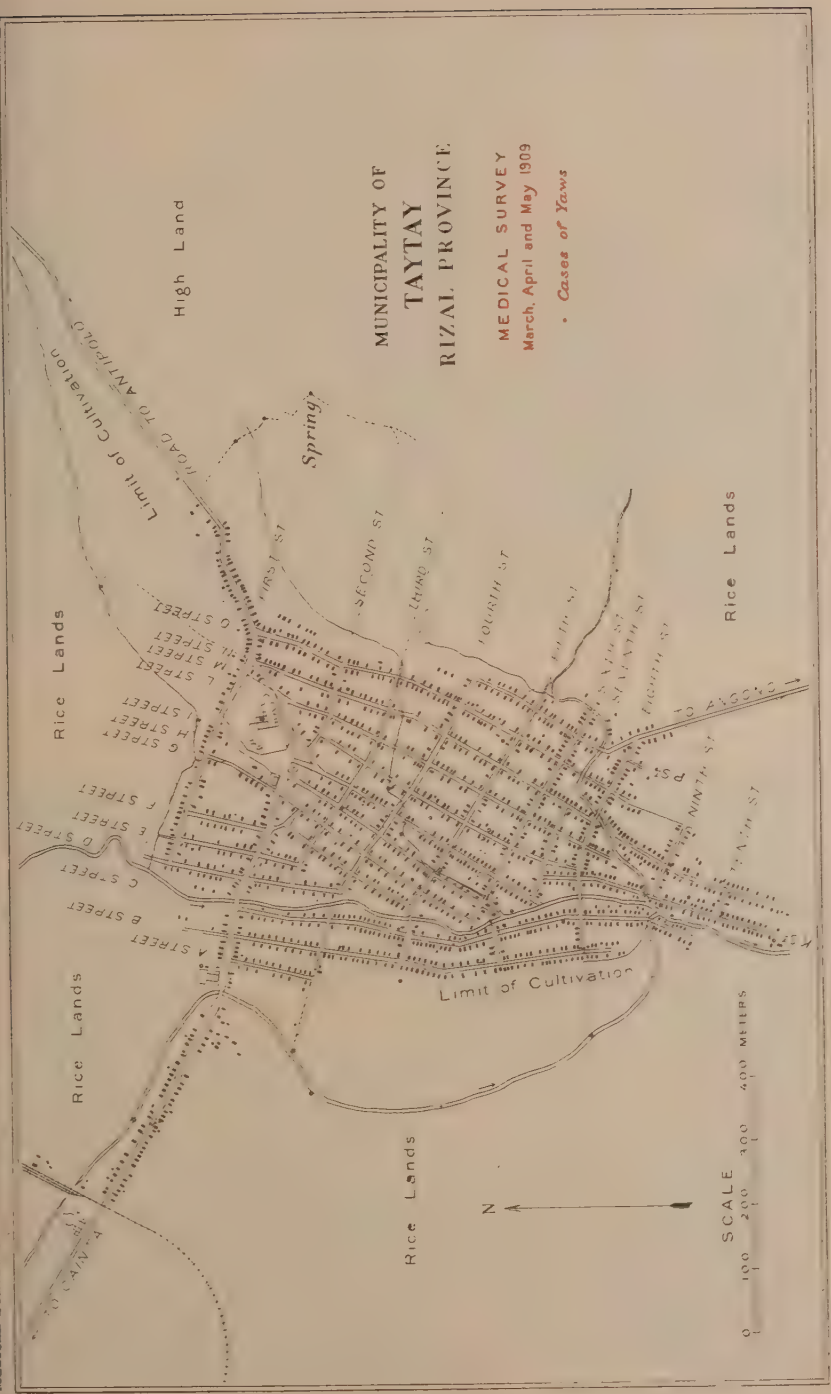






DISTRIBUTION OF CASES OF TUBERCULOSIS AND TYPHOID FEVER IN TAYTAY. (NICHOLS.)





CASES OF YAWS IN TAYTAY. (NICHOLS.)

PLATE VI.



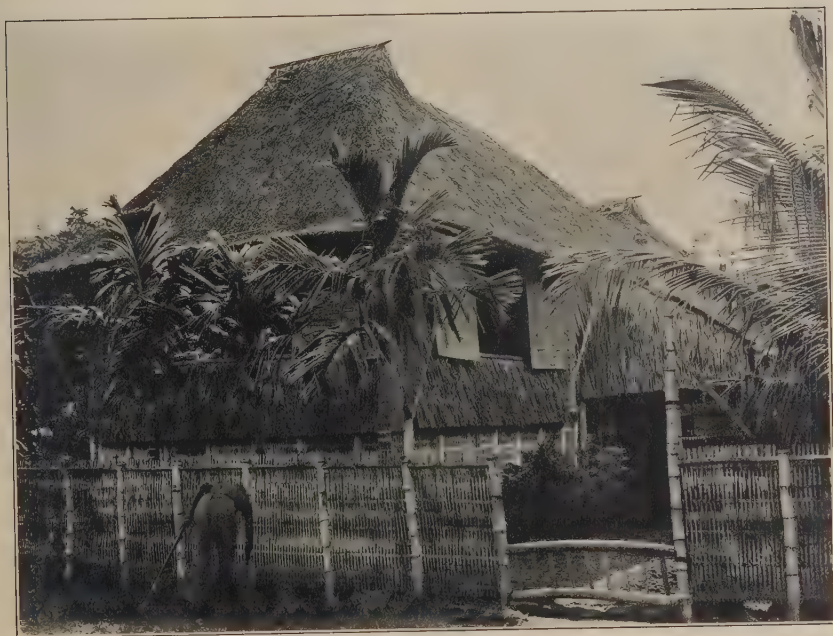


FIG. 1. LABORATORY AND DISPENSARY BUILDING.

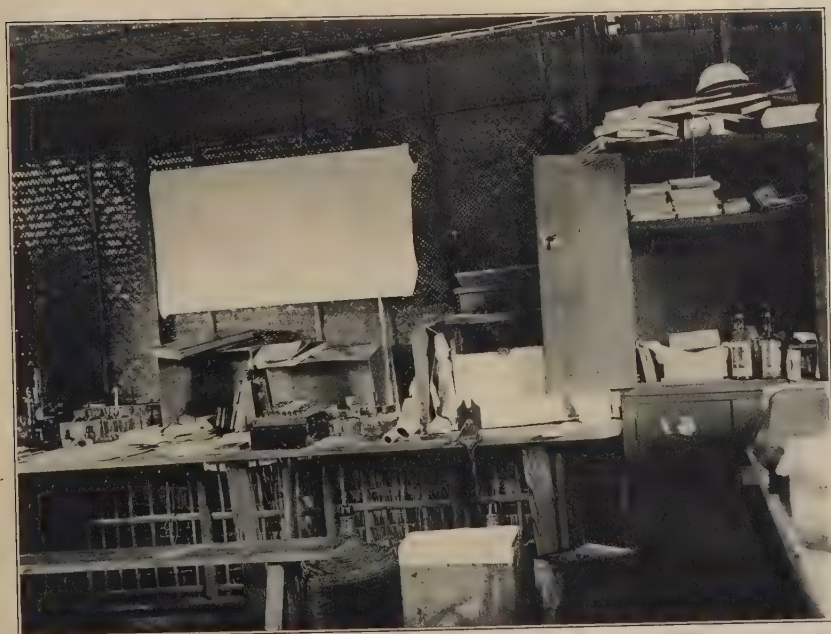


FIG. 2. INTERIOR OF LABORATORY.



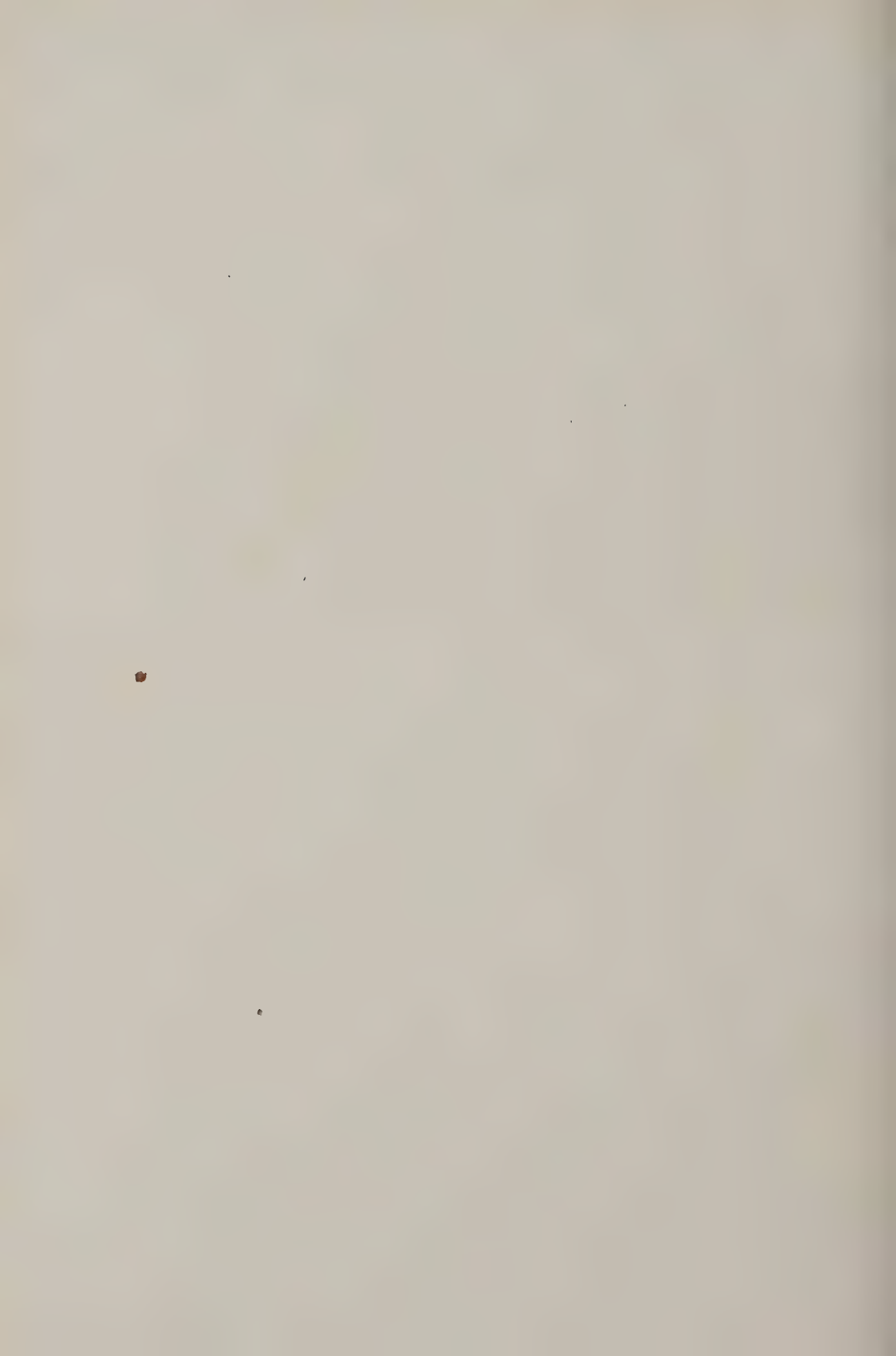




FIG. 1. TAYTAY FROM THE EAST.



FIG. 2. ROAD TO ANTIPOLLO IN TUFF FORMATION.





FIG. 1. SPRING DURING RAINY SEASON.



FIG. 2. BIG WELL NEAR MUNICIPAL BUILDING.







FIG. 1. STREET SCENE, LOOKING NORTH TOWARD THE CHURCH.



FIG. 2. STREET SCENE, LOOKING SOUTH FROM THE CHURCH.





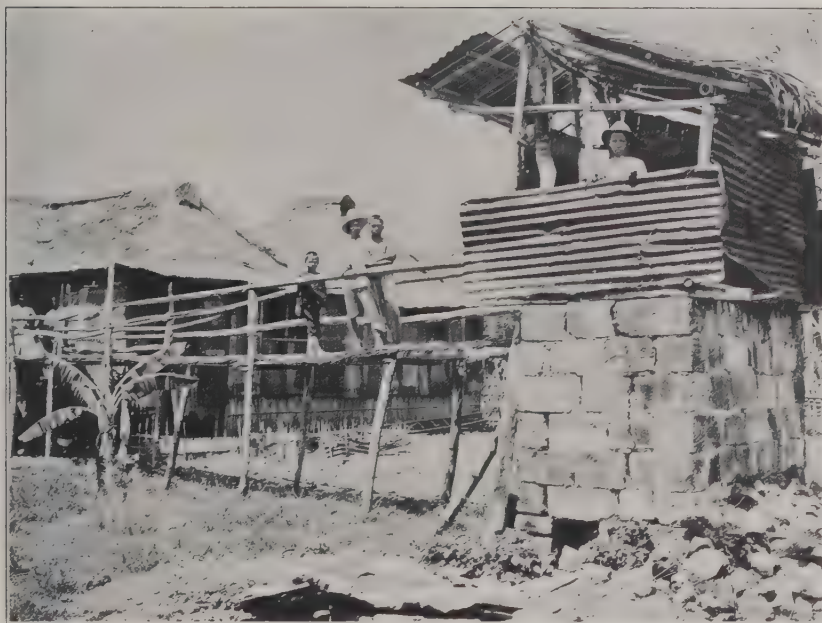


FIG. 1. OUTHOUSE WITH BRIDGE FROM HOUSE.



FIG. 2. OUTHOUSE IN PROXIMITY TO WELL.





FIG. 1. TYPICAL OUTHOUSES.



FIG. 2. OUTHOUSE WITH PROTECTED PIT.







FIG. 1. REAR OF HOUSE BESIDE THE MARKET.

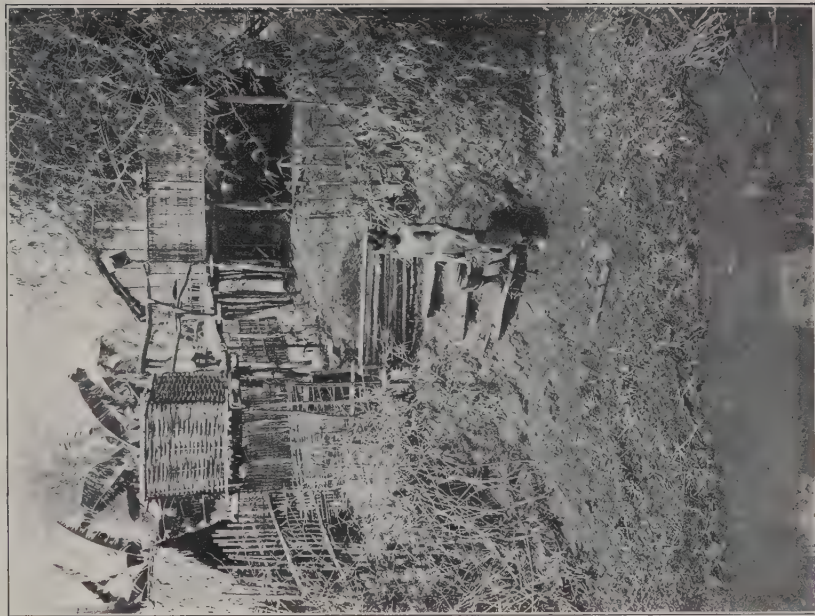


FIG. 2. THE LARGEST CREEK IN MAY BEFORE THE RAINS.







FIG. 1. ELEPHANTIASIS.

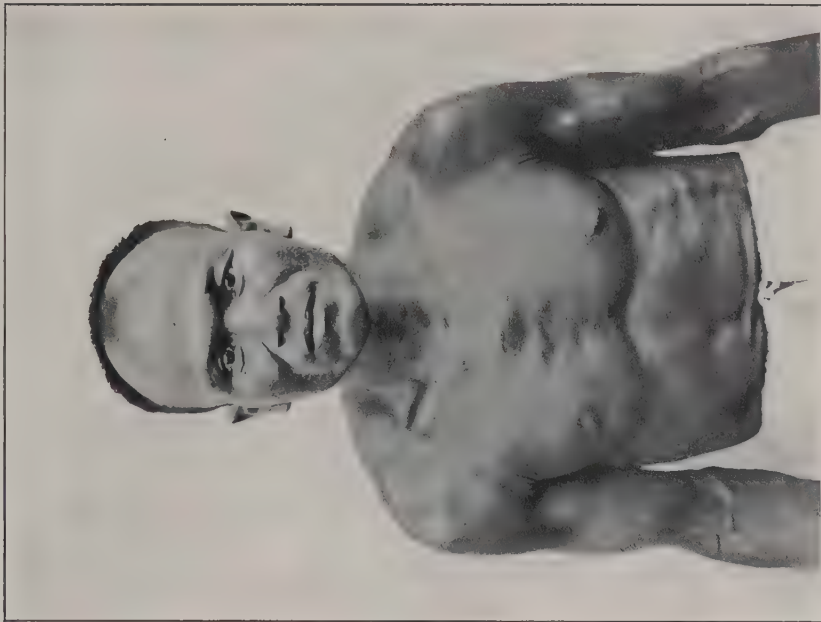


FIG. 2. BURSE ON SHOULDERS FROM USING A CARRYING-POLE OR "PINGA."





FIG. 1. GOITRE, WITH EXOPHTHALMOS.

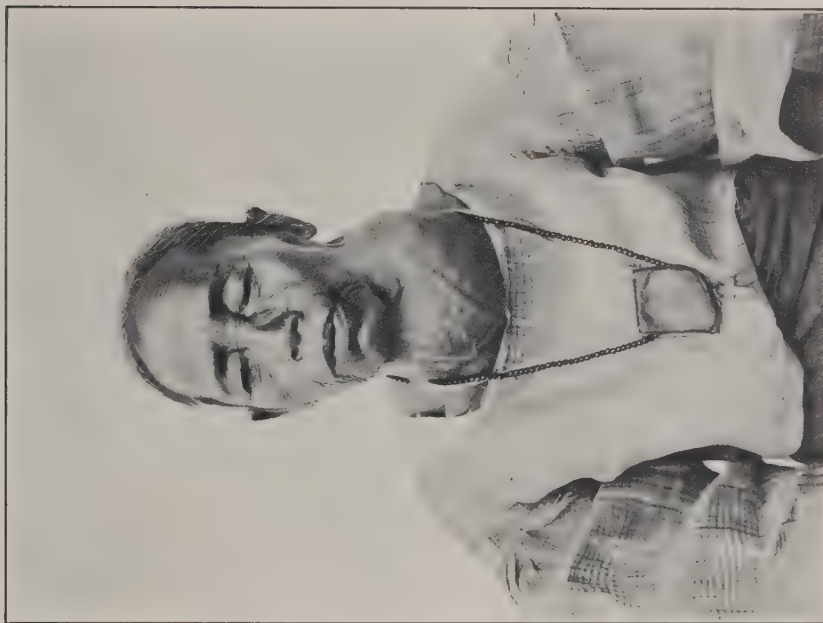


FIG. 2. SIMPLE GOITRE.





Fig. 1. SCABIES.



Fig. 2. TINEA VERSICOLOR.







FIG. 1. PUENTE, SHOWING PIECE OF WAX IN ULCER.

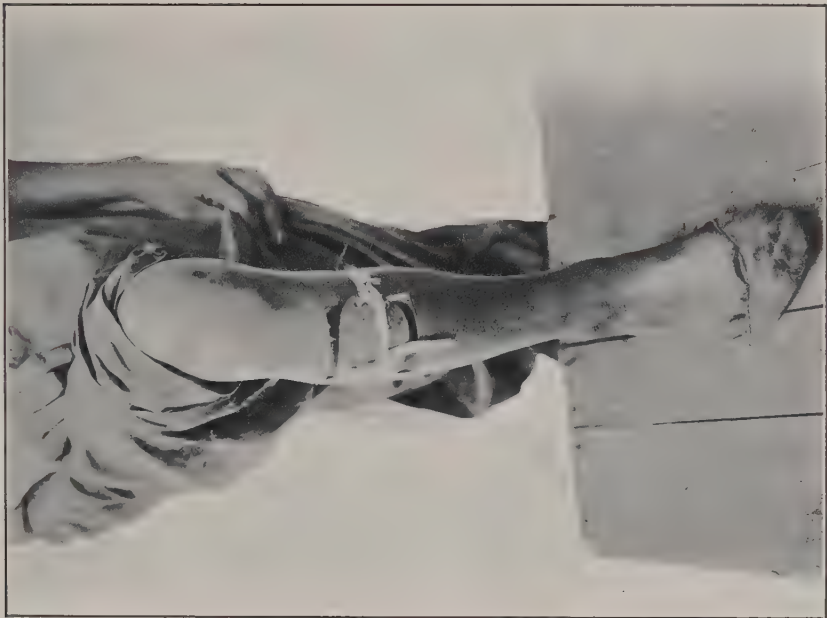


FIG. 2. PUENTE, WITH BINDER APPLIED.



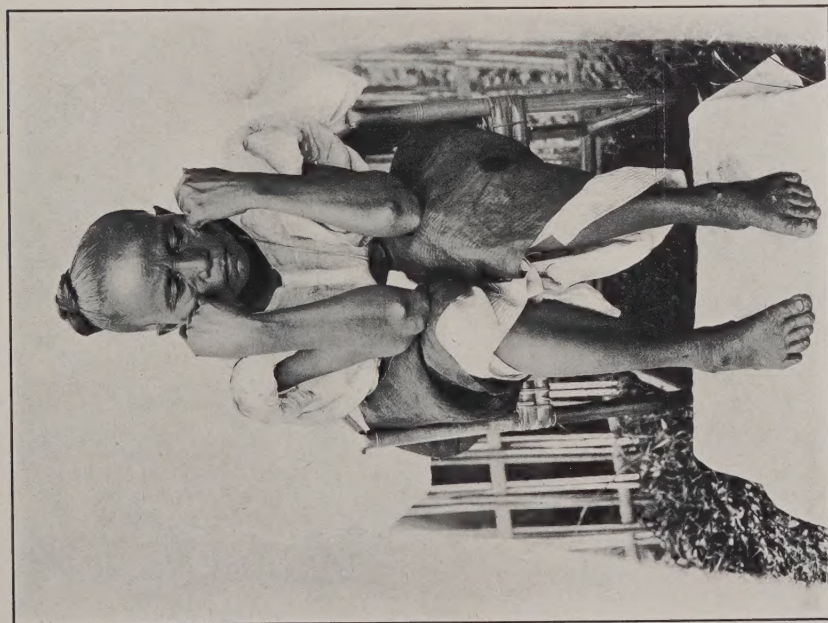


FIG. 1. SYMMETRICAL FIBROMATA ON FOREARMS AND ANKLES.

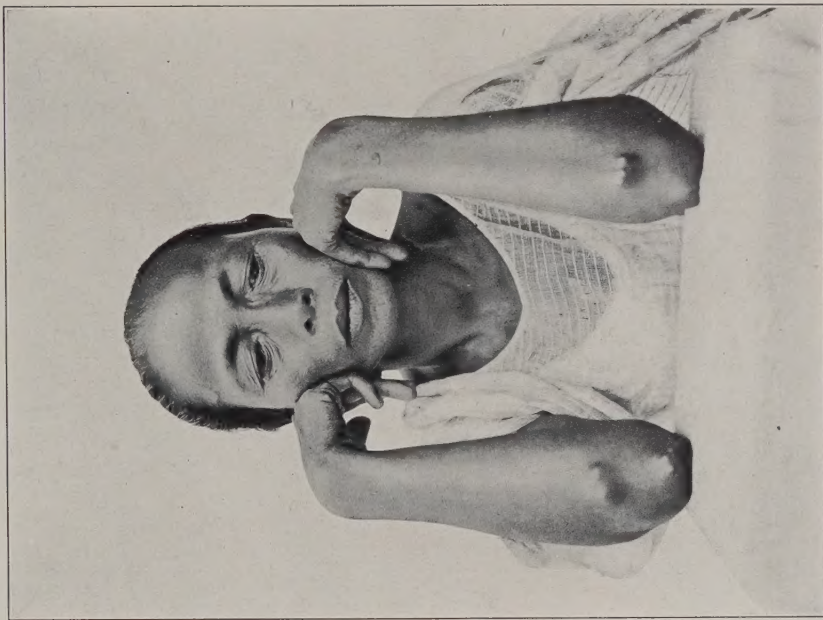


FIG. 2. SYMMETRICAL FIBROMATA.





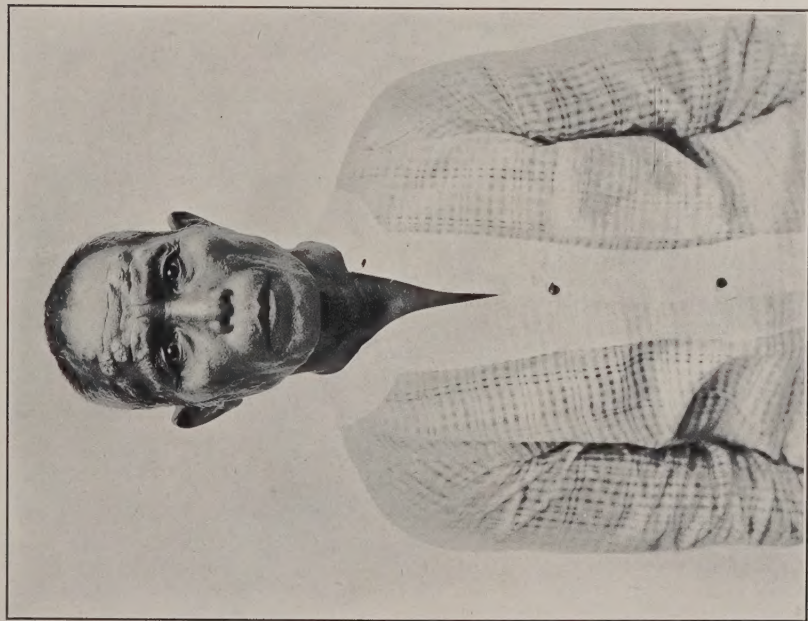


FIG. 1. YAWS IN GRANDFATHER.

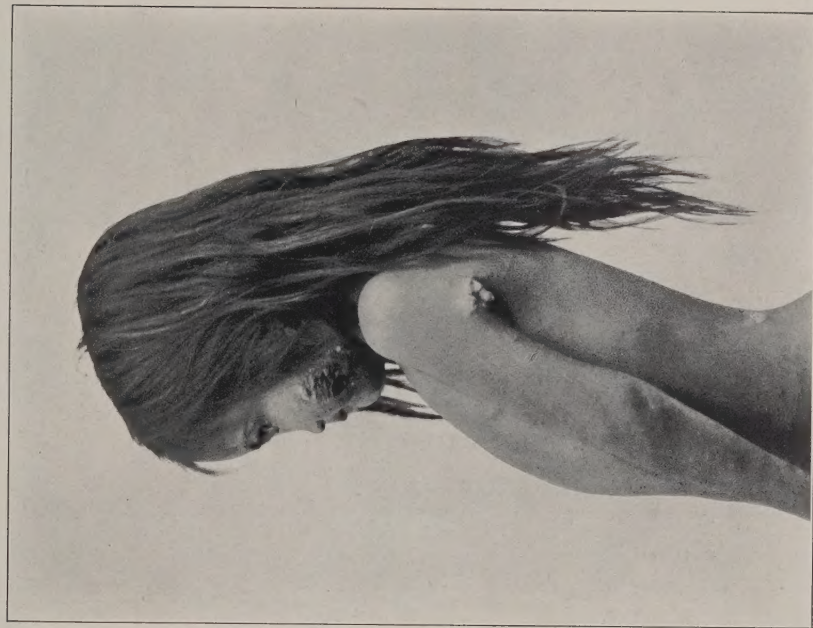


FIG. 2. YAWS IN GRANDDAUGHTER.



